













Botanical Department

CYBELE BRITANNICA;

OR

BRITISH PLANTS

AND THEIR

GEOGRAPHICAL RELATIONS.

BY

HEWETT COTTRELL WATSON.

VOL. IV.

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“ Preferring the connection of facts, which have been long observed, to the knowledge of insulated facts, although they were new, the discovery of an unknown genus seemed to me far less interesting than an observation on the geographical relations of the vegetable world.”

HUMBOLDT—*Personal Narrative.*

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*Corrections, etc.*

Pages 55 to 56.—The few words connected with the name of Sir Charles Lyell are to be read in the qualified sense attached to them on page 525 of the Postscript.

Page 215.—*Simethis bicolor* “is also said to have been found by a young botanist, near Derrynane, in the county of Kerry [Ireland], and to have been sent to Dr. Harvey for a name.” Eng. Bot. Supp. 2952.

Page 359.—The number of European species of *Violaceæ* is here entered as 137, instead of 56. The former figure appears in Nyman's *Sylloge*, for *Cistaceæ* and *Violaceæ* united as one order, and it was inadvertently substituted for 56 in checking off the figures by that work.

Page 376, line 14.—The figures should be 362 to 364, not 262 to 264. As this error confuses the reply to the query, it should be corrected by the pen.

Pages 522 to 523.—In reference to the remarks in the paragraph divided between these two pages. A “report for 1858, on novelties and critical species,” is issued in April, 1859, while this page is in type, by the ‘Botanical Exchange Club’ of the ‘Thirsk Natural History Society.’ Half-a-dozen other species (not novelties) are also there reported for provinces or sub-provinces not indicated in their ‘areas,’ as repeated in this present volume.





## I. OBSERVATIONS

INTRODUCTORY TO THE FOURTH VOLUME OF THE

### CYBELE BRITANNICA.

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CYBELE has proved to be a name more uncertain in its pronunciation than was anticipated. A suggestive indication was attempted in the first volume, page 69, by dividing the word into three syllables, thus, *Cy-be-le*. This was done in order to prevent the very probable mispronunciation of the name in two syllables only, with the final vowel mute, and giving length of sound merely to the second syllable, in the usual manner of speaking English names. But, in addition to the objectionable "Si-beel," four other modes of pronunciation have been current among botanists, which may be exemplified thus:—

"Si-bee-lee. Sib-ee-lee. Si-bel-ee. Sib-el-ee."

The Author prefers the last of the four, as best insuring the short sound of the two first syllables; the Latin dictionaries printing the name *Cy-bē-le* with the two first vowels marked short. Adopting this mode, the ordinary English pronunciation of the words *Cyn-ic* and *cyn-ic-al* may be a guide to the sound of *Cyb-el-e*. But an intelligent friend insists on the middle vowel being made long, as it is sounded when double in the English words

*bee* and *see* ; not short, as in the words *bell* and *sell*. He cites Virgil, in whose hexameters the long pronunciation is clearly required, thus, “*alma Cybēlē* ;” and notwithstanding the short “*e*” in the original Greek name Kubele. Readers will decide for themselves. Making the first vowel short, and the final vowel long, they may sound the intermediate one long or short as they deem best.

It was remarked in volume third, pages 3 and 4, that the three successive volumes of the *Cybele Britannica* corresponded, by their several dates, with the three successive editions of *The London Catalogue of British Plants* and of *Babington's Manual of British Botany*. Fourth and Fifth editions of the Catalogue, and a Fourth edition of the Manual, have been since published ; and this Fourth volume of the *Cybele* will accordingly bear some reference to the corresponding later editions of the two works mentioned. For the most part, however, the names of plants used in this fourth volume will be those given in the Index, as printed in the third volume. And contrary to the practice followed in the Manual, the tendency of a work such as the *Cybele* must be towards a combination, rather than towards a severance of uncertain species. In subdividing a species which has been long recognized and treated as single, and the notices about which have accordingly been recorded under a single name, it is seldom possible to subdivide also its recorded localities, so as to assign them correctly to the several sub-species. Following the Manual, the British species thus situate would now be reckoned by scores, or even by hundreds. In various instances those subdivisions are probably correct ; and such “*segregate*” species will here be adopted and adhered to, — at any rate, so far

as published records of their localities, or yet unpublished data within reach, will allow of that course ; which is unfortunately not always practicable. Thus, in his elaborate *Monograph of the British Hieracia*, Mr. James Backhouse has indicated their localities with sufficient copiousness (though doubtless still far from completeness) to admit of his segregate species being included in some of the lists printed in an after portion of this volume.

In regard to miscellaneous records of localities, and other data of distribution, these have become so extremely numerous and varied, that no writer on geographical botany can be expected to avoid overlooking some of them. The tables and lists to be given in this volume, with the hosts of facts reduced or generalised into numerical figures, may be deemed to bring forward the subject to the end of 1856 ; most of the calculations having been made or corrected in 1857 ; the printing being commenced early in 1858.

But the New Series of the *Phytologist* has been entirely left out of use or consideration ; because, when the alternative seems to lie between the possible loss of a few good facts, and the reception of them largely commingled with probable errors,—the former appears the wiser risk to take. The want of competent botanical editorship rendered needful the exercise of much caution, enlightened by more exact knowledge, in relying upon the promiscuous records in the original series, under the proprietorship of Mr. Newman,—but, it is believed, chiefly left to the editorship of Mr. Luxford. Subsequent changes have now placed the *New Series* considerably farther out of the pale of scientific authority ; that is to say, too far below the class of books which scientific men should venture to quote as reliable.



It is needful to give this explanation of a seeming discrepancy between the three former volumes of the *Cybele Britannica* and this present fourth volume. In the former, the Phytologist was recognized and carefully consulted up to the dates of printing. In this latter, it is deemed safer to ignore the new series of that Periodical, as now (1855—8) scarcely belonging to the category of scientific publications. A periodical printed for the purpose of sale, as a trade speculation, cannot be conducted on the same strict principles as one printed for the promotion of science. To unite the two objects, by intercepting blunders and twaddle, without repelling subscribers, would require a very competent and judicious Editor.

So many subjects crowd upon attention in commencing this fourth volume, that it becomes really difficult to answer the questions, as to which of those subjects are to be treated at any length, which of them can be slightly noticed only, and which of them must of necessity be passed over entirely? References to the works of other writers, where some of his topics are treated in detail, may often greatly assist an author who desires to abbreviate or curtail. But such assistance would here be vainly sought; no works available in this way being in existence. The *Cybele* must thus cite and arrange its own details, regarded from the geographic points of view. And indeed only details can have permanent value at present. Attempts at generalisation, so usually made in conformity with the groups of systematic botany, can have extremely little value until those groups are made more settled and uniform. It is to the distribution of species, not of groups, that attention should be given at present; and especially so in a local treatise. Hence the resort to lists of species in this volume, as condensed

summaries of details, adapted for comparison and reference.

A flora of 1500 species, real and nominal together, is much too numerous for easy handling, or to allow of descriptive details in comparing the vegetation of different divisions of Britain, even considered by itself alone, apart from the rest of the Earth. Suppose that it be sought to compare descriptively the south with the north, the east with the west, the low grounds with the mountains, one province with another, the relative frequency of the various species, the altitudes which they severally attain, &c. &c. In attempting these and other such comparisons, by ordinary readable descriptions, the multitude of names and objects would become embarrassing in a very high degree.

Any attempt to carry out corresponding comparisons between the flora of the British Isles, as a whole, and the floras of other parts of the World, would be quite futile while only a small portion of a single volume could be devoted to such an additional and more extended purpose. And it has already been found, as was quite expected indeed, that a contraction into one or two volumes, instead of an expansion into four volumes, would have better suited the purses of those very few, among English botanists, who seek anything more than a petty amateur knowledge of individual species by name and sight.

Nor would the subject of British geographical botany be at all nearly exhausted under the two leading divisions above mentioned,—the home and the foreign comparisons, &c. The flora of the whole Earth, as at present distributed and known, is in itself a fragment only. The flora of one island is a fragment of that present fragment. That which is now seen, whether widely or locally, is the result of countless changes in the past, now most imper-

fectly understood or traceable; and in turn it is itself still changing, and still advancing to something different for the future.

The history of past changes, in so far as those changes tend to explain the present existence and distribution of plants, might be deemed within the proper scope of phyto-geography. But such a history is unwritten as yet for the botany of any country; although some natural records of the past have been brought to light by geological research; and it may also be said, that others of a more recent character are now accumulating in a printed form. Both kinds of records may eventually be rendered available by our successors. But the few philosophical botanists in England at the present time, may well regret that printed records of real value have only been commenced so very recently. And the deficiency of reliable records, anterior to very recent dates, seems equally the case with respect to the botany of other countries, as it too truly is the case with respect to that of Britain.

If any books had been printed in the times of Gerarde and Ray, or even so late as the earlier career of Hudson and Smith, with objects similar to those of the *Cybele Britannica*, we might now be in possession of records much more serviceable to geographic botany. Successive accounts of the then actual condition of British vegetation, one and two centuries ago, examined from the same points of view as attempted in this treatise, would have possessed high value and interest in their utility to the science of the present day. And if the reliability of the various records, and the scientific competence and trustworthiness of the recorders, had been taken into account then, as freely as is done with regard to more recent writers,—for example, in the volumes of this present



work,—we should have now known far better on what records to rely, and in whose accuracy and fidelity to place our trust.

Nor is it at all unlikely, that much consequent improvement, with increased exactness and truth, would have been introduced into many of the local and general Floras of Britain, which have been subsequently printed;—rather, perhaps, there would have appeared other and more philosophical writings, instead of several of those Floras. One great benefit would have been found in a more early and decided check, given to that injurious tendency of English botanists, to swell out their local lists by the names of species improperly enumerated among the native plants of their locality; and too usually without any candid or sufficient explanation of the circumstances under which they were observed there.

A succeeding generation will see whether the present era is the commencement of better practices. There are not wanting some indications which appear to suggest that it is so. The *Collectanea for a Flora of Moray* took the lead in rejecting and questioning the introduced species of its district, on something like a sound and uniform principle. The *Flora of Hertfordshire*, and the *Supplement to the Flora of Yorkshire*, are local examples of advanced views as to the requirements of the topographical department of botanical science. The *Manual of British Botany* is a decided improvement on its predecessors, by the pains-taking care evinced to render it an accurate account of the flora of this country, and to identify correctly its included species with those described in similar works for adjacent countries.

Neither ought the treatise by Edward Forbes, on the supposed origin and dates of the present flora of Britain, to be wholly condemned by those who are better

acquainted with the special facts of vegetable distribution in Britain and Europe, than were the geologists and general botanists, who unwisely committed themselves to wholesale eulogy of an essay so deceptive and inaccurate. Although blundering and false in its botanical illustrations, and perhaps not less untrue in some of its zoological assertions, that treatise by Edward Forbes may still be allowed to have evinced remarkably suggestive conceptions of science, larger and more comprehensive than those which have characterised the writings of English botanists, present or past, with extremely few exceptions.

There is one part of that treatise which accords so closely with known facts, otherwise of difficult explanation, as to warrant ideas of its possible soundness; namely, that which connects the mountain floras of Britain and North Europe with the northern drift, and dates these and the mountain floras of Middle Europe from the glacial period. Whether this was honestly his own original idea, not adopted from the hints of Lyell, it is unnecessary here to discuss. It seems, indeed, to have been really the basis of the whole treatise; the rest being merely a fanciful superstructure of mere guesswork piled upon it. His three first so-called floras or types were illustrated quite inaccurately; the facts tardily used in illustration being misunderstood and misapplied, so as almost to have become mis-statements, by passing through the remodelling process of their plagiarist, after having been taken without acknowledgment from other and more true observers.

Yet there is really a local or geographico-botanical basis for these alleged floras, as rudely put forth by the present writer, many years previously (1836), in his earlier work, the *Remarks*. But the facts are incorrectly used by Forbes; and if correctly stated, the best of them will

then not bear out the inferences drawn from them by himself. The primary objection to such inferences is shortly this. The facts are adduced to support the idea of a former continental expansion to the south-westward, the extent of which would necessarily have induced a continental climate; that is, one utterly unsuitable to the existence of those insular and subalpine species of *Ericaceæ* and *Saxifragæ*, adapted only to the damp and equable climates in which they now live.

Edward Forbes is no more. The Author of this Cybele will soon be the same. But now, on looking back to the Appendix at the end of the First Volume, he finds scarcely a word there which he wishes unprinted; because he fully believes that the manner in which the Essay of Mr. Forbes was got up is correctly stated there; and because its reckless hardihood of assertion, in regard to facts, was eminently calculated to mislead those scientific men, interested in the subject, who were not specially familiar with vegetable distribution in the British Islands and neighbouring portions of the Continent, and also with the climatal adaptations of the species cited. Without that special familiarity no one can be properly prepared to give a sound opinion in the matter. On this account, when we see a Botanist of the richly merited reputation of Dr. J. D. Hooker, writing of Forbes's essay in terms of unqualified approval, we should admire his boldness more than his philosophic caution. (See *Flora Indica*, by Hooker and Thomson, volume first, page 41.)

To revert to sober facts, from that digression towards the regions of "ingenious" hypothesis. It has already been explained in volume third, page second, that the Cybele Britannica must be kept within a comparatively



restricted range. The scope of this work must needs be confined to a view of the present vegetation of Britain, and of the manner in which the component species of that vegetation are now distributed within the area of Britain itself; together with such inferences as may be drawn from existing circumstances, in regard to the probable origin of those species here; that is, whether placed in Britain by natural causes, or whether introduced by human agency. Such have been the objects in view while bringing together and examining the details about species individually and separately, which are printed in the three former volumes. And the same object will be carried forward in the present volume, by so re-arranging those details (augmented and corrected) as to convert the individual and separated facts into collective and comparative expositions. Though it will be but a dry and unreadable manner of recording the information,—one adapted for reference, rather than for reading,—an arrangement of the species into tabular lists seems best suited to effect the purpose in view; and much of this volume will consequently be devoted to such lists. The greatest amount of special and general facts can thus be recorded in a condensed form, under different points of view; and can thus be made ready for the use of Phyto-geographers, whenever the botany of other countries shall become portrayed in like manner. But it will not be until the like arrangements have been made for other countries, that Botanists will clearly comprehend the use and bearings of the *Cybele Britannica*.

No similar works are yet in existence, treating the geographic botany of other countries in like detail and fulness; although there are many treatises of a more general character,—which unfortunately means of a more

vague character. Those English readers who may desire to see information about the botany of other European countries, which is to some extent of a similar kind, can most readily do so by reading Professor Henfrey's pleasing volume on *The Vegetation of Europe, its Conditions and Causes*. That book is well written, very readable, and conveys much information in a small compass. It brings into a single volume an outline of the various treatises in relation to the geographical botany of Europe, written by many different botanists. But as those writers had adopted no uniform method, and scarcely any one work had been planned or penned with reference to the other works, an epitomized juxta-position of their contents makes an incongruous total, which insufficiently warrants the very ambitious title bestowed upon his volume by Mr. Henfrey. It would require a Collator or Compiler thoroughly and practically conversant with the subject of geographical botany, to give anything like congruity and connexion to materials in themselves so heterogeneous. The defect thus alluded to may be deemed almost unavoidable, and inherent in the nature of the book. The Author's too frequent omission of references to the works from which he derived his information (See Cybele, vol. 3, page 517) might be amended in a second edition, if called for; at once improving the usefulness of the book to beginners, and doing somewhat tardy justice to those writers, whose real researches in nature afforded the materials from which it was made.

Those botanists who may wish to read and study a complete treatise on phyto-geography, in all its varied bearings, can now resort to the highly elaborate and most valuable work by M. Alphonse De Candolle, published in 1855, under title of *Geographie Botanique Raisonnée*. This is truly an exposition of the 'Earth's

vegetation, its conditions and causes,' treated in a masterly manner. Its Author has brought together, arranged, and generalised a vast amount of information bearing on his subject. Nevertheless, it is obvious from the work itself, that the character of its Author's intellect does partake in some degree of the prevailing peculiarity of the Botanical mind, in not always reasoning with strict accuracy and soundness. M. De Candolle reasons excellently well by comparison and generalisation; but he seems less able to reason on causation and dependence. In attempts of this latter kind, his inferences appear not always warranted by the premises or data from which they are deduced. Still, notwithstanding occasional defects in its ratiocination, against which a cautious reader should be on his guard while using the work, the *Geographie Botanique Raisonnée* is truly one of a high standard, and doubtless will long be so esteemed.

As a shorter exposition of the same general subject, in an English dress, the *Class Book of Botany*, by Professor Balfour, may be also recommended. The aphorismal *Recapitulation* on pages 1037—8 is excellently given. It might be difficult to cite any other work in which an outline of the subject is condensed into a space so brief, as is well done in those two pages. The writings of Humboldt, Brown, Meyen, and some others,—valuable enough at their original dates, and according to the slender knowledge of their day,—are of less consequence now through their vagueness and inexactness. But the attractive style of Humboldt's compositions will long keep his works from becoming obsolete.

"General Remarks" may now almost always be rightly construed to mean *Vague Remarks* or *Inexact Remarks*. For example, general estimates about the number of species, or the relative proportions of orders, in distant



countries very imperfectly examined, equally as general remarks on the distribution of species through lands, not a tenth portion of which has ever been searched, must be highly uncertain through lack of sufficiently complete data. Hence the word "general," when applied to such estimates and remarks, can in truth mean only "vague" guesses or conjectural approximations.

To look homeward for another illustration of this difference. Suppose, first, that one writer mentions certain species as "British,"—intending only to say that they occur somewhere in Britain, either together or apart, either in one single spot or in two thousand various places, as chance may be. Suppose, again, that a second writer uses the term "British" to mean that the species to which it is applied are found in all the 18 provinces, or in all the 82 counties, of Britain; also, that he uses more restricting terms (say, "English, Scottish, Highland, Lancastrian, Perthian," &c.) to signify a more limited or more local distribution. In the former of these two supposed cases, the term "British" has only a general meaning;—that is to say, a vague and inexact meaning. In the latter of the two cases, it has a general meaning also;—but general in the sense of a generalised and much more precise signification.

Various writers on phyto-geography have claimed credit for "general remarks," which are in truth only remarks of the most vague and inexact kind. It would be well for the progress of knowledge, if scientific men would more clearly and habitually distinguish between those general remarks which are merely vague, and those which are truly generalisations of facts. The shewy superficiality of the former is easily attained, and at small cost of time and thought. True generalisations usually require much time and thought, combined with a scrupulous

regard to accuracy; and true generalisations are in consequence extremely rare.

One section (IV) of the present volume will still be devoted to "general remarks," in order to prepare the minds of beginners who may use the volume, to understand the groupings of details which are to follow those remarks. But as that section, though general, will truly be founded upon elaborated details, the remarks will so far approximate to true generalisations, quite as much as to generalities only. The numerical statements and summaries cannot indeed be put forth as rigidly exact; but they will be sufficiently near to exactness, to claim acceptance as something more sound than the merely vague generalities here objected against, as being almost useless in science. *See p. 127.*

## II. ON ORDERS, GENERA, AND SPECIES.

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### 1. *What are 'Orders' and 'Genera'?*

THE PHYTO-GEOGRAPHER finds grave difficulties placed in his way, at the very outset of his investigations, by the unsettled condition of systematic botany. He is frustrated in his comparisons by the uncertainties and inequalities of the groups, both ordinal and generic ; and he is more especially impeded by the variable and discordant views on species, which are so largely evinced in the practices of technical botanists. For the purpose of instituting comparisons between the vegetation of different places, of different countries, of different climates, or of different eras, the Phyto-geographer resorts to the arrangements of systematic botany, and to the descriptive nomenclature of technical botanists. He must thus deal with *orders*, *genera*, and *species*, or with similar groupings of plants. What are these? And what does the use or application of such terms truly imply?

Botanical systematists in general cling tenaciously to an idea, that *orders* and *genera* are things which have some real existence, as groups in nature, designed and intended by the CREATOR of Nature. Much apparent ingenuity, too often having the reality of narrow pedantry, is exhibited in their laboured argumentation, as to whether certain groups are ordinal or sectional, generic



or sub-generic, — as to the special character which separates closely allied orders, — and as to whether certain genera are rightly placed in this or in that order. Mere trifling on the sense of words ! The correct answer is, that the groups are ordinal or sectional, generic or sub-generic, — this or that character to be taken as the test of each, — and consequently certain genera to be placed in this or in the other order, — only as the systematists may agree among themselves that they shall be so called, characterised, or assigned ; — not because any such special groupings, and tests, and assignments exist in nature.

More reasoning men regard ordinal and generic names simply as so many terms, useful and needful for expressing conventional groupings of plants, according to the kind and closeness of their resemblances, or of some of their resemblances. Doubtless the similarities are facts in nature ; and the groups are admitted to be “ natural ” in proportion as their included plants resemble among themselves, and differ from the excluded plants. But whether their similarities shall be grouped into one hundred or into three hundred named orders, — into five thousand or into ten thousand named genera, — or into some intermediate numbers, seems to be almost purely optional and arbitrary with systematists. And further, whether the similitude shall be sought in the flowers, fruits, stems, leaves, stipules, or other parts, is also in great measure arbitrary or optional. The fancy or decision of each single systematist, however, is so much checked and controlled by the fancies or decisions of rival systematists, that the general result becomes conventional rather than individually optional.

By way of explanatory illustration, it may be remarked, that Jussieu was equally sound and correct in grouping plants into one hundred orders, as is Dr. Lindley in

adopting three hundred orders for them. The botanist who treats of the single order *Caryophyllaceæ*, may be just as correct in doing so, as is another who treats the same plants under the two orders of *Silenaceæ* and *Alsiniaceæ*. These two sub-orders are quite as separable from each other, as is the united order, or the latter sub-order, from *Illecebraceæ*. So again, it is quite as "natural" to group all ferns into the one order of *Filices*, as it is to separate them into *Polypodiaceæ*, *Hymenophyllaceæ*, *Ophioglossaceæ*, &c.

And in respect to generic groupings, those of Linneus were in the main equally good and natural, as are the more numerous genera into which they have been gradually subdivided by his successors. In example, the Linnean genus *Scirpus* was fully as natural, as is its modern subdivision into *Eleocharis* and *Scirpus*; which by a single obscure character severs in twain the more natural section of single-spiked species, only part of which have the special character of style, by which *Eleocharis* is arbitrarily separated from *Scirpus* in books.

The fact seems to be, that Nature is not a series of groups, but a series of gradations. It is Man who classifies the gradations into groups by severing the series at various steps. Thus, orders and genera ought logically to be regarded only as the conventional arrangements of human knowledge about plants, — as matters of books and herbariums, not things of Divine conception. Yet they are at any rate intended to classify and express the facts of nature, if it is done only by dissevering a series or chain at those points where the links are widest or least coherent, — where Nature is least continuous or gradual. So far as they do effect that intent they cannot be purely optional in their quality, however wide and variable may be the choice as to their quantity. And it

may be conceded by those who are least of slaves to the trammels of system-making, that botanical arrangements in books do bear an accordance with the realities of nature. Yet that accordance is imperfect and partial. In many received groups some widely dissimilar plants are brought together by very partial resemblances; and, in other instances, certain closely similar plants are thrown into different groups by single or partial differences. So to express this circumstance,—if we look inside the boundaries of one order, we there find heterogeneous constituents;—if we look at the conterminous boundaries of allied orders, we find them separating homogeneous ingredients.

The same is true in respect of genera. The example of *Eleocharis*, above cited, is an instance of a natural group split by an arbitrary character, so as to throw homogeneous species into different genera; for *Eleocharis multicaulis* much more closely resembles *Scirpus pauciflorus*, than this latter resembles *Scirpus sylvaticus*; and so with other species. But as genera are minor and subordinate groups, which can be divided and subdivided to almost any extent, short of splitting species in so doing, the examples of heterogeneous species brought under the same generic name, are not so decided as those of heterogeneous genera placed in the same order. Indeed, this kind of evidence, as to the optional or arbitrary character of generic groups, might almost disappear under the modern practice of increasing generic divisions at will,—reconverting the groups into gradations,—were it not kept up to some extent by a peculiarity of generic groups, which does not equally belong to orders and species.

It is customary with writers on elementary botany, to represent genera as groups intermediate between orders



and species; genera being smaller groups than orders, and composed of more closely allied species. This explanation may be regarded as true in the main. But it is also true, that genera are groups formed on a different principle from orders and species. They are dissimilar in kind as well as in degree. In combining individuals or varieties into species, the whole plant and all its parts are considered; and more than this, differences of duration and texture, as annual or perennial, herbaceous or ligneous, are also taken into account. But in grouping species into genera, another rule is usually well adhered to; that of looking for generic characters solely in the structure of the flowers and fruit. Genera are thus constituted on more partial and eclectic characters than are species. But when these genera, — or, rather, their included species, — are to be grouped into orders, a widened choice of characters is resorted to; not so wide as in the case of species, but much wider than in the case of genera. For example, the presence or absence of stipules, the alternate or verticillate disposition of the leaves, their venation and other peculiarities, the angular or terete form of the stem, &c. &c., are occasionally resorted to as ordinal characters, though not used as generic characters.

It is thus clear that orders, genera, and species are not strictly major and minor groups of plants, formed on uniform principles, but groups constituted on varying principles. The uniformity would be more close if the characters of orders were taken from the reproductive organs only, — or if genera had been formed and defined on more extended characters, truly intermediate between those looked to for orders and species respectively. And for the purposes of geographic botany, it is inconvenient that genera are not thus instituted on characters drawn

from the general plant, as well as from the flowers and fruit, or even in preference to the flowers and fruit. Had the genera continued to be so instituted,—as was the case before the sexual system of Linneus fixed attention so exclusively on the flowers,—the ordinal groups of the present time would probably have differed considerably from those now adopted by systematists, and in such case might likely enough have been found more in accordance with geographic groups.

But the inconveniences which most interfere with the investigations of the Phyto-geographer, in present arrangements about orders and genera, do not arise much from a want of naturalness; that is, from want of sufficiently close resemblances between the included plants, or from too slight differences between the included and excluded plants. Nor do they arise very much from the want of uniformity in the principles upon which orders and genera—the major and minor groups—are constituted. They are found chiefly in the want of greater uniformity of “value” among the groups to which the same abstract term is applied.

Botanico - statistical comparisons between different countries, and more especially between dissimilar climates, are very usually attempted by reckoning the proportions of orders, or the numbers of their included species. Yet such comparisons cannot be satisfactorily made by reference to ordinal groups, unless these groups themselves are formed on some uniform principle, so as to render them equivalents of each other in character or structure. At present this appears to be impracticable; for the best systematists fail in the attempt. Perhaps the best approximation yet made towards the desiderated uniformity, is seen in the “*Alliances*” of Dr. Lindley. Yet those alliances do appear forced and arbitrary in

various instances. And in truth they are only varied recombinations, substituted for the subdivisions of other systematists.

Examples may give a better conception of what is here intended, in saying that the orders of botanical systematists are not formed on uniform principles, and are not sufficiently co-equivalents to meet the wants of the Phyto-geographer, by giving precision and clearness to his comparisons founded upon such groups. With this object, some examples of non-uniformity and non-equivalence of orders may be cited here, and selected by preference from those represented in Britain. In the following series the names which are printed on the same line may be considered to represent nearly equivalent groups, and such as are formed on a somewhat uniform principle. But the names placed in different lines,—especially in contrasting those placed in different lines not immediately succeeding each other,—certainly represent groups which have not been formed on uniform principles, and which are not equivalents of each other.

1. Filices. Gramina. Cyperoides.
2. Compositæ. Cruciferæ. Umbelliferæ.
3. Rosaceæ. Ericaceæ. Liliaceæ.
4. Boraginaceæ. Primulaceæ. Gentianaceæ.
5. Galiaceæ. Valerianaceæ. Dipsaceæ.
6. Pinguiculaceæ. Plantaginaceæ. Typhaceæ.
7. Ceratophyllaceæ. Callitrichaceæ. Elatinaceæ.

Looking to the three several orders named in the first line, their included plants present decided and conspicuous characters, by which the plants of the same order resemble each other, and by which they may be distinguished from the plants of all other orders. The



youngest student of botany soon learns to distinguish *Ferns*, *Grasses*, and *Sedges* from all other plants. The *Filices* may be said to stand out more prominently in such respects than the other two groups. The *Gramina* and *Cyperoides* not only have much closer affinities with each other, but may perhaps also be said to have closer affinities with some other plants not included in either order. The illustration sought by the names in that first line would have been more perfect by substituting *Palmi* in place of *Cyperoides*; it being wished there to avoid the misleading influence of a generic name, as if implying that the plants are grouped together because all the rest resemble some typical genus, as *Cyperus* or *Carex* ("Sedges.")

In the second line we have three other well characterised orders. Their included plants resemble each other in several decided characters; and they are also distinguishable from all other plants by the same, or by some of the same characters. They differ, however, from the three first-named orders, by their connecting and diagnostic characters being almost restricted to the inflorescence and its parts; not pervading the plant so generally as is the case with those of the three former orders.

Of none of these six groups can it be properly said, that they constitute orders of themselves because their included genera imbricate around one central genus, on the plan of which they are all formed, with gradually increasing or varying divergencies. In looking at *Asplenium*, *Osmunda*, and *Hymenophyllum*, for instance, we see wide differences between the genera of a very "natural" group. And to those botanists who love to select typical genera, and to fancy the rest arranged around them, those differences should suggest several such types among *Filices*, rather than a single central type for all. So likewise

with respect to the *Compositæ*, the genera *Carduus*, *Hieracium*, and *Senecio* rather suggest subdivisions within the order, than relations simply to a single centre or type.

In the third line we have three orders which offer no very decided characters, sufficing to connect their included plants well together, and equally serving to separate them from all other the excluded plants. They have usually been regarded as peculiar groups by technical botanists; but the limits of these groups have greatly varied. *Rosaceæ* have either included with themselves or excluded the *Prunaceæ*, *Pyraceæ*, and *Sanguisorbaceæ*. In like manner, the *Ericaceæ* have included or excluded the *Vacciniaceæ*, *Pyrolaceæ*, and *Monotropaceæ*. And the inclusive or exclusive limits of the *Liliaceæ* have been considerably varied according to the fancies of individual systematists. And though certain genera are selected to give names to the orders, the selection seems to be made rather because those genera and their names are themselves familiar, than because the rest of the genera bear any special resemblance to them more than to each other. The first of the three orders, indeed, might be made into a better designated group by treating *Potentilla* or *Comarum* as the typical genus, and holding *Rosa* an aberrant genus,—one almost equally adapted to constitute another ordinal group, as in the case of *Pyrus* or *Prunus* with their congeners.

The principle of a typical genus becomes more clear and complete in the groups named in the fourth and fifth lines; although, for the first and last of those six orders, the genera *Lithospermum* and *Scabiosa* would seem more appropriate types, than are those of *Borago* and *Dipsacus*. These six orders may be held “natural,” inasmuch as their included plants have much general resemblance among themselves. But they are separable from some

other orders rather by small and few technical distinctions, than by any very decided characters. They are in fact groups bearing an intermediate value between genera, on the one hand, and well-marked assemblages such as *Filices*, *Gramina*, or *Palmi*, on the other hand.

Looking to Britain only, the orders named in the sixth line may be described as three pairs of genera, which are tied together passably well by mutual resemblance; but which cannot be so closely tied to any other orders, and are therefore treated as orders of themselves. When we look beyond Britain, they gain little accession of generic numbers; the *Typhaceæ* none at all. They are not orders constituted by a central type, to which a number of other genera stand in more or less close affinity, but always more similar to the type than to anything else. *Typha* and *Sparganium* are co-equals; and it would be mere caprice to affirm that either one is the typical genus of its order, from which the other is an aberrant genus.

In the seventh line, three very small groups are named. The two first of these are merely single genera which now stand as orders by themselves. Systematists have endeavoured to combine them into an ordinal group with other genera; as, for example, with *Myriophyllum* and *Hippuris*, and also some foreign genera, forming together a very heterogeneous assemblage in proportion to their numbers. The genus *Elatine*, though the only representative of its order in Britain, is not so in the general system; some other inconspicuous foreign genera being united with it, to constitute the order *Elatinaceæ*. We must thus look upon only the two first of the three groups as being really single genera, which are called orders of themselves because botanists are at a loss what else to do with them in systematic groupings.

The twenty-one orders thus selected for illustration,



may fairly be considered to represent the whole series, with reference to the principles on which they are instituted. They plainly show that the same term 'Order' is used to designate groups which are in no sense on an equality with each other. The ordinal groups of systematic botany are as much non-equivalents in their distinctive structure or characters, as they are unequal in numbers and diffusion. They are groups of twenty or fifty grades, co-equal with genera at one end of the scale, while far above genera at the other end of the series. *Filices* and *Pinguiculaceæ*, or *Gramina* and *Callitrichaceæ*, are surely groups which ought not to be placed on a par by the same designation of "natural order." It would be a juster view of nature, to put *Filices* and *Carices*, or *Gramina* and *Rubi*, on the same level of rank.

Similar remarks might be extended to genera. Although genera have been formed on a more uniform plan than orders, for reasons before adverted to, even these groups are not co-equal or co-equivalents. The species of the great and diversified Linnean genera *Erica* and *Euphorbia* (the view must here stretch beyond Britain) are surely kept together on some principle very different from that which has been practically acted upon in the subdivisions of genera among the *Cruciferae* and *Umbelliferae*. And if we compare together *Ranunculus aquatilis*, *R. acris*, and *R. Ficaria*, — or *Saxifraga umbrosa*, *S. oppositifolia*, and *S. hypnoides*, we see differences between these species that are stronger than those traceable between the genera *Brassica* and *Sinapis*, or *Carum* and *Bunium*, or *Crepis* and *Hieracium*, or *Aster* and *Erigeron*.

In comparing the vegetation of different countries, or of different climates, Phyto-geographers occasionally seem to attach much importance to the number of orders or

genera, and to the average number of species in an order; as if such numbers and averages expressed some real knowledge regarding the peculiarities of their vegetation. But such comparisons are vitiated and almost valueless when made by numerical figures only. The absence of one single well-defined order, in any one country, or at any given altitude, might imply more real peculiarity in its vegetation, than the absence of a score or two of other orders, such as approximate to generic groups by the paucity or the pettiness of their distinctive characters, as well as by the inferior numbers of their included species.

The vegetation of an island or a mountain, from which the three first-mentioned orders (page 21) were quite absent,—namely, *Filices*, *Gramina*, *Cyperoides*,—would differ immensely more from the average vegetation of the Earth, than would that of another island or another mountain, from which only the three last-mentioned orders were absent,—namely, *Ceratophyllaceæ*, *Callitrichaceæ*, *Elatinaceæ*. The total absence of a score of such orders as these latter three would be less noteworthy than the absence of any one of the first-named trio. So likewise, it may be said, a tract of country in which the *Gramina* were wanting, and their place supplied by *Compositæ*, would be a far more remarkable botanical province, than would be any similar tract, in which the *Gentianaceæ* were wanting, and their place supplied by *Primulaceæ*.

But within the restricted area of Britain we need give little present attention to the fallacies that arise from statistical comparisons based on orders or genera. Except in the direction of altitude, and of climate as varied by altitude, the differences of vegetation must be described here by species, rather than by generic or ordinal groups; although no doubt several genera, and

even a few orders, might be cited as aiding to distinguish the vegetation of Southern England from that of Northern Scotland, by their presence in the former, and absence in the latter. Still, some of the smallest "natural orders," and those least conspicuously distinguished from their allied orders, are as widely spread through the island in the horizontal direction, as are the largest and most clearly distinct. Thus *Pinguiculaceæ* and *Callitrichaceæ* extend through the length and breadth of Britain, equally as *Filices* and *Gramina*. But this is only a more general or less precise manner of stating the fact, that some species are thus widely extended. And uncertain as species may appear to be on rigid inquiry, the Phyto-geographer must nevertheless treat them as definite realities, or cease his investigations.

On the subject of systematic classification, its grades and inequalities, the views of Mr. Bentham are strongly recommended to the consideration of botanists. His clear-sighted "Memorandum on the principles of generic nomenclature" may be seen in the 'Journal of the Linnean Society,'—vol. ii. no. 5, June 1857, pages 31, &c.

## 2. *What is a 'Species'?*

It has been contended that Orders and Genera are things of human invention, not of Divine conception;—that they exist only in books and herbariums, not in nature; that they are simply terms to express the ideas of systematists, in regard to the resemblances between plants;—that the number of such groups, and the lines of demarcation between them, are conventional in practice, not fixed in nature;—and that in associating plants



into orders and genera, the groups thus formed by botanists are in no sense equivalents of each other, either structurally or numerically, although designated by the same term.

Have botanical *Species* an existence in nature more real and definite than the groups above named? Perhaps without exception every technical botanist will affirm that species have such an existence; that they are realities in nature, as definite and distinct in their way as the Man and the Chimpanzee, or the Tiger and the Lion, are believed to be by ordinary observers. But technical botanists, — that is to say, describers of genera and species, — are seldom profound reasoners; and those cultivators of science, who wish to have sound reasons for the faith that is in them, will do better by examining the practices, than by accepting the opinions of the mere describers of species, so many of whom are unequal to any higher object in science.

Two questions are involved in an inquiry as to the reality of species. It may first be asked, whether species do actually exist in nature? And secondly comes the inquiry, whether botanists know the species so existing, or supposed to exist? Although essentially distinct in kind, the two queries are practically inseparable. We cannot reply to the first question positively and logically in the affirmative, unless we can also answer the second question positively and certainly. The only certainty that species do exist in nature, definite and distinct from each other, must be derived through our knowledge of them as true species. If it should appear, on rigorous investigation, that we do not know such and such assemblages of individuals to be species, according to our abstract definition of the term *species*; but that we only infer from incomplete data and proofs that they are so;

—then, it seems quite logically to follow, that the existence of species in nature is equally an inference or supposition, and not a certain fact, so far as human knowledge yet reaches.

This appears to be the actual condition of technical botany. The existence of real species, according to a strict definition of the term, has not been fully and logically proved. But it is assumed and believed to be a truth, because the arguments advanced in support of the previously assumed truth, under present knowledge, appear to be more weighty, and more nearly conclusive, than any which are adduced against the belief. It may be said further, that such arguments appear thus weighty and conclusive, not solely to the unreasoning minds of the mere describers of species, but also to the minds of many highly reasoning men. Though the latter, be it here observed, are not usually adepts in the knowledge of species so-called; and they must thus rely rather too much upon the representations of the species-men, for the data from which their conclusions or convictions are deduced.

Now, what do we truly intend by this slippery term *Species*? In the 'Geographie Botanique,' after passing under notice various other definitions, M. Alphonse De Candolle substitutes for them the following one, as his own suggested modification. It is here rather freely than literally rendered in English. He writes,—

“I admit vegetable species as they present themselves in our own time, and with data from observation during some ages only, that is to say, as groups of individuals with sufficient mutual resemblance,—(*firstly*) to have in common numerous and important characters, which are permanent during several generations, under the influence

of varied circumstances ;—(*secondly*) if they have flowers, fertilising easily among themselves, and producing seeds most usually fertile ;—(*thirdly*) being affected by temperature and other external agents in a similar or nearly similar manner ;—(*fourthly*) in short, resembling as plants of analogous structure, known certainly to have descended from a common stock for many generations.”

It is truly much easier to find objections against this and other definitions of the term *species*, than to invent a better. That which meets the views of one botanist, may ill suit the ideas of another. Such discrepancies seem to be inevitable ; arising, as doubtless they do, from the natural dissimilarities which are so usually to be detected between the intellectual characters of different writers. Some men are more prone to abstract reasoning ; others are more fitted for physical observation. Among botanists there is a large preponderance of the simple observers over the sound reasoners ; far more of them merely observe and compare visible facts ; far fewer of them are competent to deduce correct inferences from observed facts.

It is needful to point attention to these mental differences between botanists ; because not a few of them evidently imagine that they derive some right or qualification to pronounce dogmatic opinions in matters of ratiocination, on the ground of being good technical describers or good systematic classifiers. Whereas, it often happens, that the peculiar mental bias which adapts them to shine in either of the latter departments, is precisely one which disqualifies them for correct reasoning. So frequently is this the case, that we might hold it a rule, to which the exceptions are very few, that a good technical botanist is a shallow reasoner.

Perhaps no definition of the term *species* can be framed,



which will prove acceptable to both classes of mind,—acceptable alike to the technical observers and to the logical reasoners. The definition given by M. De Candolle is to some extent incomplete and even objectionable. The first portion of it alludes only to resemblances between the individuals, which in their aggregate are deemed to compose the species; and it ignores their differences from other species or groups of individuals, which always enter largely into the practical conception of the species. Secondly, as it is admitted that nearly allied species, and also species of nearly allied genera (which ought to mean, species less nearly allied) can mutually fertilize and produce fertile seeds, the test of fertility must be deemed so far uncertain. It is thus imperfectly available, and even occasionally deceptive, as a diagnostic test. The third is a physiological character, equally or more variable and exceptional than that of cross-breeding; and it is one which would occasionally separate varieties or garden races more decidedly than species. The fourth is an analogical summary of the others, rather than any additional character.

A somewhat different definition will in consequence here be substituted, or one somewhat differently expressed. Although it is allowed to be not much more than a qualified expansion of the first portion of that proposed by M. De Candolle, it appears to be more applicable to the actual practices of botanical systematists and describers, and to be at the same time more closely accordant with the abstract or ratiocinative idea of a species. The definition will run thus:—

A botanical *species* is a collective aggregate of individual plants, closely resembling each other (*firstly*) in having certain definable characters, common to all of them, by which any of them may be recognised, and by

some of which they may be distinguished from any other plants ;—(*secondly*) the same characters being repeated in their descendants, during successive generations, for a protracted and indefinite time ;—(*thirdly*) the individuals not being always strictly alike ; but such variations as do occur, being apparently inconstant and reconvertible ; that is, either known to be so from observation, or inferred to be so from analogy.

This definition seems to include all that is constant and essential in the mental idea of a species ; namely, mutual resemblance, alienal distinctness, reproduction, reversion, and permanence ; this latter word being taken in the sense of lengthened or indefinite (but not perpetual) duration. The definition does not absolutely exclude (nor is it wished to exclude) the possibility of an eventual mutation or transition or extinction of present species. The inconstancy of varieties, and their reconvertibility to the typical forms, have as yet been well observed only for a very short period, or for a few generations of very few species. We know not how long or how exceptionless this reconvertibility has been. As an alleged fact, it is far more usually inferred or supposed, than actually ascertained by an examination sufficiently exact and continued. The limits of most species, if not those of all species, and the extent and endurance of their varieties, ought to be considered by sound reasoners as still unfixed, still unascertained. Looking to this uncertainty, and by way of practical guide towards distinguishing between true and false species, perhaps the leading tests against the latter ought to be added to any explanatory definition of the former.

A *false* species (variation, variety, race) is negatived (*firstly*) by its direct reversion into another apparent species, either under the same or under different external

circumstances; — (*secondly*) by the production of another species from its seeds, either at once, or more gradually in course of several descents; — (*thirdly*) by tracing its intimate connexion with another species through intermediate varieties, in which any differential characters become lost or blended; — or (*fourthly*) by the absence of permanent differences, sufficiently clear and strong ("important") to serve for written diagnosis.

Botanists appear to be theoretically agreed as to the two first of these four tests of a false species. If they do not always practically concur, it seems not to arise from any diversity of view as to the principle, but from different estimates of the evidence adduced in proof of re-conversion or of re-production. The third test is less generally allowed in practice; several botanists evincing much inclination to look upon such intermediate forms simply as the approximating varieties of one or other of the two alleged species, and not as truly constituting links of connexion between them; or, otherwise, they group the intermediates together as a third species, distinct from both; or, if close-driven, they make a guess at hybridity, and call this guess an explanation. On the fourth test there is little unanimity of view, in respect to the kind or to the amount of difference which justifies a separation, or in respect to the closeness of resemblance which should compel combination. Scores, perhaps even hundreds, of examples might be cited from the flora of Britain alone, in illustration of this want of unanimity in respect to the sufficing characters of proposed species.

The fourth test, indeed, is commonly nothing better in practice than the caprice or conjecture of the individual botanist. Between a Joseph Hooker and a Jordan the diversity of view is very wide, on the question as to what kind or quantity of difference should be held sufficient to



divide plants into species. If the latter could extend his views and practice over the whole vegetable world, he would probably reckon up five or ten times the number of species, that would be sanctioned and believed in by the former able systematist. And turning to minor luminaries, the differences between a Bromfield and a Babington, in respect to species and varieties among British plants, would probably have been equivalent to ten per cent., if not to twenty per cent., of the whole flora of the British Islands. And yet it may be, that those two observant English botanists would have closely concurred in their abstract ideas and definitions of the term *species*.

Definitions and tests about species, indeed, are more frequently admitted in theory than adhered to in practice. The prevailing custom with botanical describers, especially the more local describers, is that of looking out almost exclusively for differences, by aid of which the plants can plausibly be described as true species. They do not group individuals into species;—they separate them into species. Small botanists who can achieve nothing higher in science, make haste to name specifically, and to describe accordingly, every or any form which they happen to meet with; doing this seemingly on the chance that it may turn out to be a species, and that they may thus gain the credit of a discovery. Sensible of the injurious consequences from such practices, a recent reviewer of De Candolle's 'Geographie Botanique' thus concludes his well-penned article:—

“Systematic botany, which it has been the fashion of late years to hold in so much contempt, is nevertheless the groundwork upon which the correctness of the speculations of the physiologist and geographical botanist must mainly depend. But the botanist who devotes himself to

it, should always bear in mind that it consists not in the technical description of specimens, but in the due appreciation of species and affinities; that he who demonstrates a fact such as the specific identity of two plants hitherto believed to be distinct, or the affinities of an obscure vegetable, renders a far greater service to science than he who discovers, describes, or invents any number of supposed species." (Edinburgh Review, October, 1856.)

### 3. *Uncertainty of Species.*

Of the species described in systematic works probably not one in a hundred, perhaps not one in a thousand, has ever been subjected to any crucial test of its distinctness and permanence; for instance, that of sufficiently repeated reproduction through seeds, under circumstances well adapted for trying its constancy. Numbers of them have been originally named and described from very few individual specimens, brought home by travellers, who likely never looked for intermediate and connecting varieties, and seldom attempted to raise them afresh from seeds, through a series of descents, either at home or in the native lands of the presumed species. It is not a very rare practice, indeed, to found species upon a solitary specimen or two, or even upon a single fragment of a plant; so that difference from other plants, whether slight or strong, is thus practically made the sole criterion of a species; and without ascertaining whether its differences will prove casual or permanent.

When specimens are collected in distant countries, and brought home for description, the arrangement of them into species must unavoidably be done in accordance with the resemblances or differences between few

individuals; and the species thus resolved upon must often be described from incomplete series of specimens. It would be a worse alternative for science, not to name and describe them at all.

Unfortunately, the procedure which is thus unavoidable with respect to the plants of distant countries, or of lands seldom visited by scientific collectors, has become the routine practice with local describers also; men whose opportunities might be rendered greatly superior, if their truth-seeking industry were anywise equal to their name-seeking vanity. Among the so-called species of the British Islands, we find that some have been described and named from single individuals, and many others from specimens far too few and incomplete for certainty. In short, it must be admitted by all truthful and logical botanists, that in a vast many instances the reputed species of plants, which are enumerated and described in systematic works, have not been subjected to any sufficiently ample tests of their distinctness and permanence as true species. Even the greater number of British species have either not been thus tested at all, or have been examined and tried very incompletely under this point of view. They have been named and described, or they are adopted and continued as species, much more usually because they are not known to be otherwise, than because anybody has ever tested and proved them to be real species; that is to say, fully coming up to the definition of a true species, and bearing the tests of a false species. The few botanists who do occasionally endeavour to apply the before-mentioned tests to any proposed new species, are usually denounced as rude and insulting, by the botanist who (to use the language of the Reviewer quoted on page 34) has "invented the species" or has made "a technical description of the specimens."



With a disclaimer of any wish to give just cause for offence, and a denial of the right in any one to take offence because his published doings are subjected to published comment, recourse shall here be had to a very recent example of species-making, in illustration of the practice objected against. Comparing the third and fourth editions of the 'Manual of British Botany' (1851 and 1856), we find in the latter a novel species of *Ranunculus* or *Batrachium*, described under the name of *R. floribundus* (Bab.), and a novel species of *Arctium* under name of *A. pubens* (Bab.) Let it be assumed or admitted as a fact, that since the date of the third edition of the Manual, published in 1851, its Author has discovered some clear characters by which individual plants of these two alleged species can be recognized as of the same species, and by which they can also be satisfactorily distinguished from all other species.

Now, may it not reasonably be inquired, in respect of these alleged species,—How many generations have been seen by Mr. Babington or any other botanist, known to have descended from seeds of the same individual plant or plants?—Whether they have regularly reproduced their own likeness for any considerable number of generations?—Whether any varieties have been looked for and found, or raised from seeds?—And if so, whether these varieties have again been converted into the original types, by reproduction or otherwise? If the "inventor" (the Reviewer's term) of those species cannot answer these questions, in such manner as to show that the plants are true species, it must be clear that he does not know the *Ranunculus floribundus* and *Arctium pubens* to be true species; and that he only guesses them to be so on some analogy, actual or imaginary, with other supposed species. In short, observing that certain indivi-

dual specimens of *Ranunculus* and *Arctium* differ in some degree from other specimens, Mr. Babington forthwith assumes that they will have all the other characters of true species, organic and physiological; and he becomes their baptismal sponsor that they now have, and that their descendants also shall have, such characters. Unfortunately, quasi-species do not always fulfil the promises made for them by their sponsors.

Another illustration may be borrowed from the same botanist. A few specimens (was there truly more than one?) among those hitherto designated by the name of *Dryas octopetala*, are found to resemble each other, and to differ from the rest of the examples of *D. octopetala*, in having the base of the calyx less convex and the sepals somewhat broader, — differences so slight as to have escaped the regard of all botanists down to the year (say) 1840, if they were then more than a very temporary and recent variation. Therefore, these one or few specimens, found on a single hill in Ireland, and any others that may hereafter be found like them, are to be renamed *Dryas depressa*, — cannot lose their slightly distinguishing peculiarities, — are the unchanged descendants of predecessors for centuries of years back, — will reproduce their own like for centuries of years to come, — and if any of their own descendants shall be anywise different, those differences will not be perpetuated, but will disappear again in the descendants of the changed plants, if not in the individual plants themselves.

All these inferences or mere suppositions do seem to be by no means necessary consequences of a trifling difference in the calyx between the specimens of *Dryas* from Ben Bulbin and those from other hills; more especially so, since the same form of calyx has been subsequently sought in plants on the same hill without success

by another botanist, Mr. Andrews. And yet this is practically the reasoning of botanists who thus "raise varieties to the rank of species." Because one or few specimens are found to differ from the rest in two very trivial peculiarities of form,—therefore they have also all the permanent and physiological peculiarities which are believed to divide species. Surely, this cannot be regarded as logic of the highest quality!

It is not here insinuated that the practice of thus guessing species on very imperfect grounds, rather than seeking to know them by experimental observation, is anywise peculiar to the learned Author of the *Manual of British Botany*. On the contrary, he acts in this wise only after the fashion of most other technical describers. His *Manual* is resorted to because it affords very recent examples, specially appertaining to the flora of Britain; and which are thus more apposite illustrations than any of the quasi-species proposed in other countries, or at older dates in this country. It can readily be shown that the practice of inventing or adopting book species, which may or may not be recognized eventually as natural species, is no new practice with British writers. The uncertainty and variability in the numbers of species, at different dates and in different books, may be cited in evidence that book species and natural species are not at all identical, assuming the latter to have a real or proved existence.

Perhaps the tabular and numerical form may best serve to illustrate the wide diversities of view as to species, prevalent among the botanists who have published Floras of the British Islands within the last half-century or a little more. The number of species into which the several Authors have divided some of the larger genera, is indicated opposite their names in the subjoined list;



changes in the genus, under which any given species was placed, being allowed for in reckoning the number of species. The corresponding allowance, towards reduction of numerical discrepancies, could not be so satisfactorily made in the case of added species; because it is occasionally too difficult to decide whether an Author was unacquainted with the "species," since described as novelties by his successors, or whether he had regarded them simply as unimportant varieties of those which were described by himself. Such editions of the works as happen to be at hand are here used, and are identified by their dates.

*Varying number of Species.*

	Rubus.	Salix.	Hieracium.	Potamogeton.	Saxifraga.	Poa, L.
Withering, 1796 .	6	22	10	11	11	14
Hudson, 1798 ..	5	18	7	12	10	14
Smith, 1800 ....	7	45	10	10	14	15
Withering, 1812 .	7	48	13	13	15	16
Smith, 1818 ....	8	56	16	12	20	15
Gray, 1821 .....	8	56	16	14	25	21
Smith, 1828 .....	14	64	16	13	25	15
Hooker, 1835....	13	71	18	15	21	14
Lindley, 1835,...	21	29	17	12	24	15
Hooker, 1842....	14	70	13	17	16	15
Babington, 1843 .	24	57	19	19	20	20
Arnott, 1850 ....	5	37	18	18	16	16
Babington, 1856 .	41	32	33	21	20	21

Thus, whether we compare together different Authors, publishing at nearly the same dates, or the same Author, publishing at different dates, it is seen that much discrepancy existed in their ideas of species. But a further contrast between the varying views of the same Author, at short intervals, may even more clearly show how uncertain still are the practical ideas about species, as

put forth by technical botanists, whose business it should be to know species, but who too often only describe plants.

Of late years it has been made compulsory on Students of Medicine to acquire a smattering of botany, although useless to them as medical practitioners. From this hardship imposed on the students some benefit has accrued to the purses of professional botanists. Among other ways, it has caused a considerable demand for such Floras and other elementary works as are adapted for class-books in the lecture-room, and are portable in the field. Hence there have been new editions, in rapid succession, of Hooker's British Flora and Babington's Manual of British Botany; and the latter work will afford a suitable illustration, bearing on the uncertainty of species in books.

Four successive editions of the Manual, to appearance each one carefully revised by the Author, have been published in about a dozen years. The Author of the Manual may be said to know the special botany of the British Islands far more completely and critically, than it is known either by the first Author or recent Editor (Dr. Arnott, editions 6 and 7) of the British Flora. On this account the four successive editions of the Manual,—dated in 1843, 1847, 1851, 1856,—may afford a good criterion and example of the uncertainty of species, by a selection of several genera and generic sections which are differently divided into species in the various editions. (See the subjoined list, on the following page).

In this list the genera are so placed as to bring into view the fact, that the changes are not in one direction only, but in the two opposite directions of increase and decrease in the numbers of the species; further, that

both kinds of change occur both in large and in small genera.

*Number of Species at different dates.*

	1843.	1847.	1851.	1856.
Rubus .....	24	36	43	41
Salix .....	57	58	33	31
Hieracium .....	19	21	27	33
Galium .....	15	15	14	17
Atriplex .....	10	11	9	9
Epilobium .....	10	10	11	12
Batrachium .....	4	5	7	12
Aretium .....	2	2	2	5
Ulmus .....	7	7	2	2
Filago .....	3	3	5	5
Cerastium .....	9	9	8	8
Lastrea .....	6	8	8	8
Quercus .....	3	3	1	1
Thlaspi .....	3	3	4	4
Urtica .....	4	4	3	3
Sparganium .....	3	3	4	4
Barbarea .....	4	3	3	3
Polystichum .....	2	3	3	3
Pyrethrum .....	3	3	3	2
Glyceria .....	2	3	3	3

Facts such as are shown in the two lists, ought to convince any reasoning man who may hitherto have imagined Species to be things fixed and certain in nature, that nevertheless down to the present time many of them are far from being fixed and certain in books. Where then is the proof of their certainty and fixedness in nature? If in existence anywhere, in regard to the plants of England, it ought to be found in the books of a diligent Botanist, who has devoted his attention during many years specially to the plants of this one country, comparatively of small area; who has travelled much over that area, as a practical investigator; and who has well



studied the descriptive works relating to the same species of plants in adjacent countries. Yet the books of this Botanist show much uncertainty and variability. And by the instance of the *Dryas* before adverted to, on page 38, we may see that the uncertainty can be extended to one of the oldest and most widely recognized species, by splitting it most unequally in twain.

A second example of an Author widely at variance with himself on species, may be taken from a work devoted exclusively to the Ferns of Britain. The beautifully illustrated 'History of British Ferns' by Mr. Newman, has had three editions, dated in 1840, 1844, 1854. These editions differ remarkably in the number of species described in them as distinct, namely, 33, 40, 50 species,—plus also some demi-species to increase the latter high number. Yet during the interval of 1840—1854 scarcely half a dozen actual novelties were added to the lists of British ferns; the changes of number being otherwise induced by subdividing some of the species of the earlier editions into two or more species of the later editions.

With reference to the former remarks on generic groups, page 18, it seems to be further deserving of note here, while attending to Mr. Newman's botanical writings, that the number of genera also has a corresponding increase in them. The 33 species of the first edition were arranged under or into 18 genera; and in the third edition the same species are divided among 23 genera. It would thus seem to be a fair inference from the practice of our best Pteridologist, that the genera of ferns are also in some degree conventional or optional, equally with the species. The fact is so; but simply because sometimes one character, sometimes another character, is arbitrarily adopted as a distinctive test of a genus, according to the whim of the individual writer. To revert

here to the uncertain limits of genera is somewhat interruptive of our onward course; although it is but a further illustration of the like impediment in the way of phyto-geographical expositions, as that arising from the uncertain limits of and between species.

#### 4. *Inequality of Species.*

Intimately connected with the uncertainties in the characters and limits of species, comes another inconvenience to the phyto-geographer. Among the species of Britain, as now named and described in books, there is seen much the same sort of inequality or non-equivalence, as was before shown to be the case with the ordinal groups of systematic botany, and more briefly asserted of generic groups. It may be said that some species stand out clear and distinct, and are rarely or never confused with aught else,—at any rate, not with aught else in Britain; also that they have thus existed for some centuries, and in all likelihood during many centuries. If they sport into varieties, the most reckless “describers of specimens” do not venture to treat the casual varieties of these plants as species. Thus stand out the single or few native species of *Bellis*, *Linnæa*, *Parnassia*, *Trientalis*, *Adoxa*, *Calluna*, *Andromeda*, *Clematis*, *Myrica*, *Tamus*, *Paris*, *Myosurus*, *Chrysosplenium*, *Cornus*, *Rhamnus*, *Triglochin*, *Scilla*, *Lythrum*, *Linum*, *Astragalus*, *Convolvulus*, *Vaccinium*, &c. It is true, however, that the species of several of these genera cannot be held thus clear and certain when our scope extends beyond Britain. But, even in this wider view, we should only require to substitute the names of other non-British genera, in place of those so altered or affected. The fact would remain the same, though exemplified differently, that there are plants

which botanists seem all agreed to recognize as true species, distinct from all else, and indivisible in themselves,—apparently having the same limits in nature as in books.

But further, there are many other species which are regarded in the same light by some botanists, although by other botanists certain sub-species or quasi-species are split off (so to write) from them. Thus, the *Dryas octopetala* might have been placed above among the single indivisible species, such as *Parnassia palustris* and *Trientalis europæa*, had not the very doubtful quasi-species *Dryas depressa*, as already mentioned, been split off from it by Mr. Babington. But as this petty chip from the old species had no diagnostic characters of any seeming value assigned to it, and was apparently a mere casual variety, since unsuccessfully sought by Mr. Andrews in the only spot indicated for it,—we really ought not here to say that the well-known and widely-diffused *Dryas octopetala* has been divided by botanists into two species. The more appropriate explanation would be, that a spurious book-species has been incorrectly carved from the natural species by one botanist, prone to “describe specimens.” Thus also, various other British species have been more or less unequally subdivided, by the severance of doubtful book-species from them. For example, *Ulex Gallii* (Planchon), *Helianthemum Breweri* (Planchon), *Melampyrum montanum* (Johnston), *Geranium purpureum* (Forster), *Herniaria ciliata* (Babington), *Cerastium atrovirens* (Babington), *Cerastium pedunculatum* (Babington), *Teucrium scordioides* (Schreber), *Epilobium brachycarpum* (Leighton), *Ribes petræum* (Smith), *Ribes spicatum* (Robson), with various others, may be in this position of spurious species; such as are not easily distinguished, and probably not distinct, from the more



familiar species to which they would still be referred by some or most botanists.

In a different position from the preceding are various other old species, about the subdivisions of which into two or more modern species there is a more general and less doubting assent among botanists. Thus, the Linnean *Ranunculus hederaceus* has latterly become two well-marked and pretty equal species, by the separation of *R. cœnosus* from it;—a disjunction made by several botanists in different countries independently of each other. The Linnean *Veronica agrestis* appears to have been as properly divided into two species of equal value or certainty, by the separation of *V. polita* from the form left as typical with the original name;—though, in making such divisions, it would avert much consequent confusion in after records, if a new name were given to each half; the original name remaining to the aggregate only.

Between such seemingly correct and equal divisions of old double or combinate species, and the unequal segments capriciously chipped off a good unit-species, as in the cases of *Dryas depressa* and *Cerastium atrovirens*, many intermediate steps are traceable. Thus, it may still be held more or less uncertain, whether we have in Britain one or two species of *Euphrasia*, *Thymus*, *Apera*, *Agrimonia*, *Taxus*, *Quercus*, *Juniperus*, *Caltha*, *Nuphar*, *Raphanus*, *Circæa*, *Botrychium*, *Pseudathyrium*, *Ruppia*, *Zannichellia*, &c. And it may still perhaps be questioned, whether the Linnean unit-species *Thlaspi alpestre*, *Cardamine hirsuta*, *Epilobium tetragonum*, *Valeriana officinalis*, *Arctium Lappa*, *Filago germanica*, *Ballota nigra*, *Primula veris*, *Statice Armeria*, *Atriplex hastata*, *Parietaria officinalis*, *Sparganium natans*, and others were rightly regarded by the great Swedish botanist as

single species ;—or, whether they are more correctly now regarded as aggregate species by his less great successors ; each name formerly including two or more species, the modern segregates into which the unit-species of Linneus have been subdivided.

Among British plants the Linnean *Ranunculus aquatilis* affords a good instance of the various grades of inequality or value in species. It was long held as one single species, and is even still so regarded by some botanists of high authority. From age to age, and latterly almost from year to year, other quasi-species have been separated from it ; until at length it has been altogether discarded from the fourth edition of the Manual of British Botany. It has been gradually hacked into nothing ; its fragments being now held as so many species, of various grades of reception and uncertainty, ranging downwards from those rather easily distinguished, and very usually admitted, such as *Ranunculus circinatus*, to those only distinguishable by their inventors, if even by them, such as *Ranunculus floribundus*. The variable unit or aggregate species has been divided and subdivided into segregates of most unequal value, —into true-species, quasi-species, sub-species, sham-species, and so on. The like process has gone on with various other Linnean species, as *Rosa canina*, *Rubus fruticosus*, *Salix fusca* or *repens*, *Saxifraga hypnoides*, *Myosotis scorpioides*, *Hieracium murorum*, *Mentha sativa*, &c. &c., which were probably aggregate species originally, and which are now as probably subdivided into too many segregates of very unequal value.

Possibly, a reader may still find difficulty in seeing what is here intended by “inequality of species.” It may be logically contended, that any given plant is either a species or not a species, according to abstract defini-

tion of the term. And that all such natural species ought to be held equals and equivalents of each other. Right enough. But the difficulty arises from our ignorance as to which are truly natural species; and the consequent necessity of treating book-species in their stead. Unfortunately, botanists are very far from agreed as to what are or ought to be book-species. One botanist will still regard *Ranunculus aquatilis* as a single and indivisible species; a second botanist divides it into three species; a third botanist can find half a dozen species in it; a fourth botanist will double that modest number; and some will perhaps even exceed the full dozen species. Here, unless a whole is only equal to any of its parts or fragments, such species cannot be equal among themselves. There is no equality between the following unit and any of its fractions,— $1 \frac{1}{3} \frac{1}{6} \frac{1}{12}$ . Or, to put the matter under another aspect, is the *Rubus fruticosus* a species when it includes only the *R. discolor* of the present day? And is it equally a species, or an equal species, when it includes forty or fifty other species or subspecies of the present day? And can it, in either application of the name, be counted one and co-equal with the species *Rubus Idæus* or *Rubus saxatilis*? The term *super-species* may not be much admired, but it will suffice for the moment in contrast against that of *sub-species*; a term now adopted by various botanical authorities, as one that is practically convenient, although not consistent with the strict definition of the non-compound term *species*. Three grades of species may now be shown thus:—

1. *R. fruticosus*,—a super-species, or aggregate.
2. *R. saxatilis*,—a true species, or indivisible unit.
3. *R. discolor*,—a sub-species, or segregate.

It is made too evident in the preceding examples, that the term *species* has an application in practice quite as



unequal and inexact as that of *order*. The term is applied alike to the clearest species and to the merest variety, provided any technical botanist may think fit to describe that variety as a species. It is applied alike to the largest aggregate and to the smallest segregate therefrom (*Rubus fruticosus* and *Rubus argenteus*) to which any botanical pretender may give a specific name.

The inequality or non-equivalence of book-species most seriously impedes the Phyto-geographer in his investigations. He cannot institute any just comparisons between the botany or vegetation of different countries, unless he can bring their respective species to the same standard of value. A thousand species of India, as fixed and described by Dr. J. D. Hooker, would be far more than equal to a thousand species of Europe, as defined by M. Jordan. Suppose that it is wished to institute statistical comparisons between the botany of the British Islands and that of New Zealand or any other country. Are the native species of *Thalictrum* to be counted three or five? Are those of the *Batrachium* section of *Ranunculus* to be reckoned two or twelve? Are we to set down the species of *Rubus* at five or at fifty? Wild as such queries might appear to some readers, they do not exaggerate the actual differences about species, as evinced in the opinions of living botanists.

The impediments to phyto-geographical investigations, which arise from these uncertainties about species, are by no means limited to questions of number. The identity or otherwise of species in different countries cannot be satisfactorily traced, while the limits of those species are unfixed. Where one botanist sees sameness, another sees only similitude; where this botanist finds identity, that botanist finds only substitution. The areas and

distribution of species cannot be ascertained while their specific names mean one thing here and another there. Records of localities made under the aggregate name cannot be certainly assigned to the segregate species. An example or two of these difficulties may be serviceable in illustration.

In the admirably commenced *Flora Indica*, by Drs. Hooker and Thomson, pages 109—112, the Authors give “a list of 222 British plants which extend into India.” Among these plants are enumerated the following species:—*Ranunculus aquatilis*, *Barbarea vulgaris*, *Cardamine hirsuta*, *Melilotus officinalis*, *Rubus fruticosus*, *Erythraea Centaurium*, *Callitriche aquatica*, *Potamogeton natans*, *Eleocharis palustris*, and *Carex flava*. These are Linnean species; and down to the present time they have been held single species by a gradually decreasing number of botanists. But various sub-species or segregates have been as gradually carved from them by other botanists; and some of these sub-species (once so deemed) may fairly now be designated as currently admitted true species. Are the typical forms of these Linnean species found in India? Are all the sub-species found there? If not all, which of the sub-species are so found? Or, are the Indian plants really other sub-species, different from those of Europe? The names used by Drs. Hooker and Thomson do not enable us to give an answer to these queries. But comparisons between the European and Indian botanies, in the estimation of those botanists who regard the above names as applicable to aggregate species, cannot be satisfactorily made before those questions have been answered.

Such questions are of course by no means special or peculiar to Indian botany. They might equally be asked with reference to various of those European spe-

cies, which were alleged to have been found in Australia by Dr. Robert Brown. In fact, they may be deemed queries applicable in greater or less degree to the botany of all countries, to the smallest and nearest, as well as to the largest and most remote. In comparing the vegetation or floras of different subdivisions of one country so small as Britain, much error might arise unless the species were first brought to a common standard.

Let it be supposed that we desire to trace through Britain the distribution of *Epipactis latifolia*. In the older works on British botany, and even down to those of recent date, this name included the *E. ovalis* (Bab.) and *E. media* (Fries) along with the species still left under the name of *E. latifolia*, after taking off those two segregates. When we look into the books printed some years ago, and there find localities for *Ep. latifolia*, it is often quite impossible to say which of the three modern species was intended by the name. All three might be included, or one of the three only might be intended by that name in a local list. Even down to the present year, some botanists doubtless are recording the segregates under the aggregate name, without enabling the Phyto-geographer to decide which of them is thereby intended.

It is only by one who has largely engaged in botanico-geographical investigations, that the doubts and difficulties thus continually engendered can be fully appreciated. It must for a long time keep geographical botany far backward; because the Phyto-geographer cannot look only on living and dried plants. He must be continually using back records as well, in the making of which these modern distinctions were not used or known; that is, he must consult records in which the segregate species of the present day are treated as unit-species under names



which are now the names of aggregates. For instance, what can back records do towards showing the distribution of the two very recent species before alluded to, *Arctium pubens* and *Ranunculus floribundus*? Obviously, nothing at all. While the invention of these book-species must vitiate the back records for those older species from which they have been carved; that is, in the eyes of all the botanists who adopt and believe in these novelties.

Under such circumstances, it is not surprising that Phyto-geographers usually feel inimical to the practice of hasty species-making on very slight grounds;—that they should so strongly object to the habit of pouncing upon any trifling difference between plants, and recklessly assuming at once, without the trouble of test or trial, that the plants thus slightly different will have also all the theoretic characteristics of true natural species. The Phyto-geographer desires to know natural and distinguishable species as clearly and as numerous as he can find them to be. But he wishes not to be himself misled by false species, or to be impeded and perplexed by the records of other botanists who are also misled by them.

### 5. *Permanence of Species.*

The theoretic definition of the term *Species* (page 32) was so worded as to include a repetition of the individuals, representatives of the species, during many generations. But it was not made a part of the signification of the term, that the duration of a species should be perpetual. Geological records show that the species of epochs long past were not the same as those of the present time; and consequently, so far as the future can be

inferred from the past, the present species will in their turn give place to different species of the future.

Geological researches have hitherto failed to explain how this change of species has been accomplished between the past and the present. And it cannot be said that we now detect in current events any satisfactory clue, sufficient either to explain the past changes, or to point out the future changes in expectancy. But it is equally true, that the facts and events of the present time, when looked upon from this difficult point of view, do not warrant an assertion, that the past species have not themselves been gradually changed into the present different species. The facts and events of the present time have hitherto not been studied with that exactness and freedom from bias, which are necessary for an investigation so delicate and difficult. And the past records of similar facts, even those of very recent date, are usually found to be too inexact for reliance, when carefully examined with reference to their bearing upon this question.

The ideas of Lamarck, to the effect that species can and do metamorphose into each other, have been much and often commented upon. In some few instances they have been critically examined in a just and truthful manner. More frequently they have been misunderstood by shallow reasoners, or misrepresented by unscrupulous writers. Unfortunately, most of the just and truthful examiners, competent to reason on natural phenomena, have not been sufficiently conversant with the technical details of zoology and botany, and have gone astray for want of that special knowledge. Perhaps it would not be erroneous to name Sir Charles Lyell as an example of the truth-seeking reasoners, not familiar enough with special zoology or botany, to steer his way quite correctly

in this matter. It is certainly curious to find that celebrated Geologist,—who has so successfully advocated the theory of gradual metamorphose or change in the past condition of the inorganic world, similar to the gradual changes now seen in progress,—departing from the suggestions of analogy, and arguing against any similar course in the organic world of nature. The inorganic changes are argued to have been gradual, even from moment to moment, and to have been thus effected without continually renewed and special interference of CREATIVE POWER. But the organic changes are supposed and contended by the same writer, to have required many millions of such special interferences ;—each of the species appearing on the earth, in countless and seemingly endless succession, being a new creation, and not emanating from any predecessor species. At any rate, there is a total want of consistency and harmony in these two opposite and opposed views of the course of Nature. Whether the inconsistency is human, or the discord is Divine, it remains for a future generation to discover.

Theological doctrines have doubtless contributed very largely to give scientific men, and especially those who had some secular interest to serve thereby, a decided bias towards the views of organic nature advocated by Lyell and most others who have entered upon this debateable ground. Such views appear to concur best with preconceived ideas ; and they are therefore received with satisfaction by the generality of readers, whether advocated by a sincere writer, like Sir Charles Lyell, or by one of a different school, like the late Hugh Miller. There is a vague impression—it can hardly be termed anything better or more settled—that the theory of a mutation of species is in some way or other hostile to Biblical records. And this vague impression influences the minds of



scientific men none the less strongly because they are themselves not aware of the unreasoning bias thus given to their thoughts. The arguments of Lyell in this matter are referred to with much eulogy, even by botanists of very high attainments and influence; and yet they do appear to the author of this volume about the least satisfactory portion in his very attractive writings. Lyell is not a man of species; and he cites loose records of experiments, in which the species are not mentioned by their proper scientific names, with a strict and single meaning, but by names which apply to more than one species, and thus vitiate the records by their inexactness and uncertainty. Lyell detects the weaknesses of Lamarck's facts and arguments; but he fails to see that his own cited "facts" are no better,—perhaps, indeed, much worse.

Good botanists, equally as geologists, become gravely inconsistent when they begin to dogmatise on this subject. A recent example of this inconsistency may be cited here, as being very pertinent to the matter in hand. The 'Geographie Botanique' of De Candolle is made the basis of a good article on geographical botany, in the Edinburgh Review for October, 1856. Early in that article (page 497) the writer overlooks the danger of asserting a negative in science, and boldly declares that the doctrine "of successive development is purely hypothetical, and unsupported by a single ascertained fact."

That such theory cannot be held much better than conjectural hypothesis, is true enough. It may also be true, that no clearly ascertained and perfectly unexceptionable fact of direct mutation has been cited in support of that theory or hypothesis. But is it not equally as true, that the Lyellian doctrine of new species of animals and plants, *created* at the rate of "*one new one every year*"

called into being" (Lyell) is quite as hypothetical, and quite as little supported by ascertained facts?

Nay, if we are to believe the marvel, which the Reviewer very inconsistently expresses his own readiness to believe, there is far better evidence towards showing a mutation of species, than ever has been adduced towards showing a new creation of species. The change of one generally recognized species into another such species, and the gradual change in a dozen descents, from one recognized genus into another such genus, would be more than a single ascertained fact, in strong support of the doctrine of successive development.

The Reviewer believes in these changes. A few pages after so dogmatically denying the existence of any such fact, the Reviewer particularly mentions the experiments of M. Esprit Fabre, by which the *Ægilops ovata* is stated to have been gradually converted into *Triticum sativum* in thirteen years, passing through another received species, *Ægilops triticoides*, in the first stage of this very rapid conversion. After a page or two of comments on the reported experiment, the Reviewer added the following sentence, so strangely inconsistent with his previous assertion, that the successive development hypothesis is unsupported by a single fact: — "*We have no doubt,*" he writes, "*that by patient perseverance in this course for a number of years, not only many so-called species of Ægilops would be reduced to one type, but M. Fabre's experiments, resulting in the conversion of Ægilops into wheat, would again meet with the same success.*"

Notwithstanding this inconsistency and self-contradiction, there is ample internal evidence that the article in question emanated from the pen of an experienced writer and first-rate botanist. It certainly is remarkable to find one of this class thus confidently announcing his belief,

that several generally admitted species can be converted into one species, and that in only thirteen descents one genus can be converted into another genus, not extremely similar. When such a writer and botanist announces such a belief, we are thrown back upon the questions, Whether permanent species exist in nature?—And how we know them to be such?—Also, which of the now received species (if any) are permanent,—and which of them are thus convertible? In short, are there any species?

If *Ægilops* can change into *Triticum*, why not *Triticum* into *Brachypodium*?—*Brachypodium* into *Bromus*?—*Bromus* into *Festuca*?—*Festuca* into *Poa*?—&c. &c. Genera do thus change—in books. Whatever may be the facts in nature, as to the lines of demarcation between species, those between many genera are uncertain and fluctuating in books. There are species whose generic characters are so ill-defined or uncertain, that they are assigned sometimes to one genus, sometimes to another genus, of the couplets named above. And the like mutual convertibility in botanical arrangements, by changing the generic place of a species, may be found between numerous other genera in books. But those books profess to show the truths of nature, and to record human knowledge of nature. Human knowledge, it is thus seen, cannot trace positive lines of demarcation between genera any more than between orders. In other words, such positive lines of demarcation, though feigned in books, are not discovered in nature. Orders pass into each other by the existence of genera that are assignable to either, at the option of botanists. Genera pass into each other by the existence of species that are assignable to either genus. Species appear to pass into each other by the practice of botanists, who unite and sever them in different degrees and numbers.



But does NATURE warrant these changes of species? Granting the non-existence of distinct lines of demarcation between ordinal or generic groups, it is still not a necessary inference that the analogy ought to be extended to species. Notwithstanding the discordant views of botanical writers, it may still be, that natural species are really not groups of individuals thus mutually convertible, or without any positive limits between them. *A species* may be something in nature far more strictly individual and distinct than a genus or an order. All its constituents or representatives may possibly have sprung from a single and distinct origin in each case, continued either by direct partition or by reproduction (which is only another mode of partition.) And that origin may not ever have been a preceding and different species. And as the present species shall run out their allotted duration, and disappear from the earth in their turn, it seems quite possible that none of them will thus disappear by (or after) giving origin to some succeeding and different species. The practical question now comes by inquiry, how far does our actual knowledge avail us towards establishing any such individual distinctness of species,—present, past, future?

Actual knowledge goes a very small way towards settling the mooted question; although we do certainly construe the ascertained facts of nature as being, on the whole, adverse to the doctrine of a gradual mutation of species, and favorable to that of their permanent distinctness. Reference may again be made to the '*Geographie Botanique*,' pages 1056—1125, for a full general exposition of facts and opinions bearing upon this and kindred questions. But in making this reference, it may be useful again to remind readers, that the Author of the '*Geographie Botanique*' is a greater proficient in comparing and generalizing facts, than he is in the art of inductive

reasoning from facts to causes and consequences. The Author of the *Cybele Britannica* still retains the views set forth in the *Phytologist* for 1845; and the concluding summary of those views may here be appropriately quoted; with a reference to the periodical mentioned for the arguments and facts in more detail.

“The conclusion, that ‘like produces like,’ through an indefinite series of generations, seems almost inevitable to the botanist, whose range of observation takes in only the natural course of events during the quarter of a century, more or less, which comprehends the period of vigorous mental power in a single individual. The same conclusion must still appear sound, although we extend the range of observation, by comparing living plants of the present year, with careful descriptions, pictorial representations, or dried specimens of those which lived a hundred years ago. Still the same conclusion must be drawn, when we compare a young oak or chestnut with old trees of their kind which have existed through centuries past.

“Thus far, the resemblance between the past and the present, in the vegetable world, is sufficiently close and certain to warrant a conclusion that plants repeat their own images by hereditary descent through a long series of years, to which we can assign no limit.

“These images, it is true, are not always perfect likenesses. Variations of climate and soil, or of other conditions, are accompanied by corresponding variations in the plants. But, limiting the period of our observations as above, these variations are usually found to be temporary; so that we may say, there is a standard or average type for each kind, which is repeated in the individual plants as nearly as internal health and external conditions will allow. This supposed standard or average I will

here express by the term 'central type.' The central type will be nearly synonymous with the proper metaphysical notion of a species, apart from its varieties. It is usually this same central type which is described in the specific character of a plant; although occasionally authors endeavour so to frame their specific characters, that these shall include all varieties of the species as well as the central type.

"Individual plants which differ from the central type are named 'varieties.' Among varieties we may include all the plants which are marked by any obvious difference, ranging from the more trifling variations of colour and size, to those which are so wide as to raise a question whether the plants really belong to the same central type or species.

"Varieties appear to be less permanent than the central types from which they originate. A tendency to change again is usually observed in the descendants of such varieties; and the further change is frequently in a reversed direction, or back towards the central type. Among plants in a wild state, the tendency to keep or to resume the central type commonly seems to be greater than the tendency to vary from it. Hence there is an appearance of permanence in species, as though each kind had a limit to its power of change, beyond which its descendants can never pass in a direction aberrant from the central type, and from which limit there is a tendency to return to that type.

"But all this, be it remembered, refers to a very restricted period in the history of our globe. It is that space of time only, the events of which are most clearly seen and understood by botanists. And it is so very short a space, compared with the spaces which come into the estimates of geologists, that we can scarcely deem an



inappreciable change of the central type, during that short space, to be sufficiently conclusive proof against the gradual transition of species during spaces of time immeasurably more extended.

“Moreover, we must avoid the straining of our fact beyond its true bearings. Though the central types of certain species may have remained the same during some scores or centuries of years, this one fact cannot negative a possibility that there are also varieties of the same or of other species which, during the same time, have gradually become more and more unlike their respective central types; until, through diminished likeness, they may now actually be referred to different central types,—that is, may be described as distinct species.

“Further, it is to be kept in memory, that when it becomes man’s interest or pleasure to extend the variations of plants from their central types, he can effect this desired result much more rapidly and widely than is seen to occur among plants in a state of nature. By taking the more decided varieties as parents of a fresh stock, through several successive generations, and so gradually rendering them more and more unlike the central type, we appear to weaken their tendency to resume that type. Hitherto, no limit has been ascertained to this power of changing plants by varying varieties. Some of the species which have been long subjected to this process, have been run into varieties so widely different from their known or supposed central types, that if any botanist had first found their extreme forms in a newly explored country, he would assuredly have believed them to belong to different central types,—to be totally distinct species.

“In this, as in every other such process, man works only with the powers of nature. Although brought about immediately through his instrumentality, the changes

effected in the plants are simply the natural results of those conditions to which he subjects them. There seems no reason to suppose that the same result which man brings about more rapidly, could not have been brought about, though more gradually brought about, without his interference. If man can produce hereditary varieties of plants, which remain permanently different from their central types, under his care, why cannot nature also produce such hereditary varieties? And in what respect does an hereditary variety, the origin of which is unknown, differ from a species? \* \* \*

“On the whole, however, we seem to be justified in asserting, that our knowledge of the present events in nature, taken by itself, should incline us to a conclusion which is directly adverse to the theory of ‘progressive development’ or ‘transition of species;’ yet without affording us any actual disproof of that theory.

“It is otherwise when our range of thought embraces the vastly wider space of time, the events of which are investigated by geologists. There we find ample evidence to justify the conclusion that different species succeeded to each other. And no better mode of accounting for this succession has been suggested, than the hypothesis that one species passed into another, under changing external conditions. Supposing this transition of species to have taken place very gradually, and through a very long series of descents, it would not require more rapid change (from central types into varieties, and from a less variety into a greater) than we see actually occurring in the production of varieties at the present period of the earth’s history.

“Could we ascertain that some varieties will continue to vary from their central type, through many successive descents; and that, as they become less similar to their

original central type, the tendency of 'like to produce like' will overpower and supersede the tendency to revert to the original type;—in this case, we might hold the 'transition of species' to be a theory founded on facts. At present, it is scarcely more than a plausible hypothesis, invented to account for facts, and accounting for them better than any other hypothetical suggestion hitherto has done." (Phytologist, vol. ii., pp. 225—228).

A recapitulation of the points at which we have arrived in the preceding sections (1 2 3 4 5) will show these results:—1. Species are not proved to be permanently and unchangeably distinct in nature.—2. During a short section of time, as one or more centuries, species do appear to continue the same, and to reproduce continuously their own like; the variations therefrom constantly tending to return to a form which is assumed to be a normal or natural type ("central type") of the species.—3. Technical species, or those described in books by technical botanists, are theoretically supposed to correspond with the natural species.—4. But very few of such technical species are ever subjected to those tests which are deemed adequate to establish natural species.—5. In practice, the technical species are instituted chiefly or solely upon differences of physical and external characters, without knowledge whether those differences are casual or constant, and accompanied or unaccompanied by the physiological characteristics of natural species.—6. On this account reasoning men must regard the technical species described in books as conjectural rather than certain; their complete identity with natural species being usually left in doubt, and in many instances disputed.—7. Botanists of authority, both cotemporaries and successors, often differ widely about the validity of



the technical species; thus showing them to be largely conjectural, or arrangements by opinion and caprice.—8. Hence arise the differences as to aggregate and segregate species; some botanists combining more, other botanists dividing and subdividing on slighter differential characters.—9. Since they are the conjectural or technical species which are described in books, and are enumerated by name in catalogues, the Phyto-geographer is compelled to treat these as if they were the true natural species.—10. And where he finds Authors differing in their groupings of individuals into such technical species, he is often obliged to adopt the aggregate, in preference before the segregate species, on account of the greater difficulty and uncertainty in tracing the distribution of segregates by aid of books and catalogues.\*

\* “It is very much to be wished,” write Drs. Hooker and Thomson, “that the local botanist should commence his studies upon a diametrically opposite principle to that upon which he now proceeds, and that he should endeavour, by selecting good suites of specimens, produced under all variations of circumstances, to determine *how few*, not *how many* species are comprised in the flora of his district.” . . . . “The unavoidable tendency of the human mind, when occupied with the pursuit of minute differences, is to seize on them with avidity, and to relinquish them with regret; hence the irresistible desire to rest contented with a character, however bad, so long as it is obtained with difficulty, and in the observer’s opinion is tolerably constant. It is strange that local naturalists cannot see that the discovery of a form uniting two others they had previously thought distinct, is much more important than that of a totally new species, inasmuch as the correction of an error is a greater boon to science than is a step in advance.” (*Flora Indica*, vol. i. pages 35, 36).

### III. ON THE INTRODUCED SPECIES.

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#### 1. *Definitions, Opinions, &c.*

Which of the species now seemingly wild in Britain are aboriginal natives?—Which among them ought to be deemed introduced plants?—The answer to these two queries is difficult; and in regard to many of the plants it can be given only with much uncertainty either way. The synonymous terms *native* and *indigenous* are applied to those species which are believed to exist in Britain independently of human agency. And the non-synonymous terms *introduced* and *naturalised* are applicable to species which were originally brought into Britain through the instrumentality of mankind, whether intentionally or accidentally. But recorders of localities, and other writers on British plants, evince much ignorance and carelessness in their use of these terms.

To the category of *Native Species* we must unavoidably assign all those in regard to which no grounds are now seen for supposing that they were first brought into Britain by human agency. The application of the term is thus simply negative. It can rarely or never be known, whether the species existed in Britain before the advent of mankind, or have immigrated into this country more recently; and if the latter, whether their immigration has been effected by natural means of transport only,

as distinguished from those afforded to them by human agency. It is possible that none of these species were aboriginal natives on the present surface of Britain. It may be that all of them were immigrants into the British islands, at different dates, from other lands; those lands, or some of them, having subsequently ceased to be. Such uncertainties belong at present rather to geological, than to geographical botany; and they cannot here be discussed. The broad line of distinction is here to be drawn between natural and human agency;—natural agency being assumed, where human agency is not obvious or suspected.

In the second category, that of *Introduced Species*, are placed all those which are supposed to have been brought into Britain through the instrumentality of mankind. In some few instances they are known to have been so introduced; notably in the case of some American species, which were unknown in Europe before the discovery and settlement of the Western Continent. In far the majority of instances botanists only infer or suppose that a species has been introduced, because they can detect some remaining indications of human agency in the conditions under which it is still observed to exist here; the inferences suggested by the present conditions being occasionally corroborated by historical or traditional evidences also. But it seems quite within possibility, and even within reasonable probability, that the indications of human agency may have become obliterated in various instances. And if such instances do occur, the plants so situate, although only naturalised aliens, are now unavoidably placed in the same category with the aboriginal natives.

If they have become established sufficiently well to maintain themselves among the native vegetation, with-



out the aiding interference of mankind, introduced species are then deemed *naturalised*. It is much to be regretted that an excessive laxity has prevailed among British botanists in their use of this term. Several of them apply it to mere casual stragglers which have acquired no constant or permanent localities; some of them even to trees and long enduring herbs, which simply continue to live and grow where planted; and which thus increase only in their dimensions, not by numbers. Strictly, no species ought to be deemed naturalised unless it maintains its ground here by seeds or other usual mode of multiplication, and unaided by human agency.

M. Alphonse De Candolle would limit the use and signification of the term so strictly as to exclude even those agrestal species, such as the poppies and fumitories, which appear to be in anywise dependant upon agricultural operations for rendering the soil suitable to their support. Though this may be considered the just and philosophic view, scarcely any British botanist has approximated to such a degree of strictness. In some measure it was attempted in the definitions in the first volume of the present work, page 63, by separating the colonists from the native species, and placing them below the doubted category of denizens, — below those species which may possibly be natives, may possibly be aliens. It was thus tacitly assumed that most of the annual weeds of corn fields and other cultivated ground, seldom found elsewhere, had been originally imported into this island, howsoever abundant and widely diffused they may have since become. But in general British botanists place those weeds in the category of undoubted natives.

M. De Candolle has further suggested, that there ought to have been in this work a special category for *naturalised* species, in contradistinction against those for

natives, colonists, &c. The answer to this suggestion, or objection against the omission of such a special category, seems obvious enough. Naturalisation is not a simple fact, which would admit of the simple answer to its question,—“aye” or “no.” Naturalisation is a matter of degree, far more than one of kind; and we have no scale whereby to measure the degree of it, unless by individual opinions. But the distinction between native and introduced species is absolute and real; the only difficulty or uncertainty being in a verdict on the matter of fact. There are not degrees of nativity, or degrees of introduction; though there are differences of opinion regarding the evidences in support of either view in reference to individual species.

With the exception of a few known importations from America, as before adverted to, the most thoroughly naturalised species are perhaps now included among the undoubted natives. The denizens follow close upon those reputed natives; being also deemed natives by many botanists, but more or less strongly suspected to be naturalised immigrants by other and often fewer botanists. Then succeed the colonists, most of which are still deemed natives by a majority among English botanists; are looked upon only as more or less fully naturalised plants by other botanists of England; and are held to be aliens, not even naturalised, by M. De Candolle and some very few others of his school. Lastly, comes the miscellaneous group of aliens, so designated in this work; in regard to which there is the widest range of non-unanimity among botanists, whether to hold them natives, or naturalised, or non-established aliens. Before we can make out a list or category of naturalised species we have, first, to separate the introduced from the native species, and then, secondly, to agree upon some test

by which the introduced species can be again divided into naturalised and non-naturalised. This is hopeless. The first difficulty is little likely to be surmounted for a long time to come, that of distinguishing between native and introduced species. The more completely a foreign species becomes naturalised, the greater becomes the inclination of English botanists to place it among the true natives; so that we find some of them now treating the parsley and wall-flower as true natives. And thus naturalisation is converted into nativity, so far as mere opinion can effect such a conversion.

In former volumes of this work citations were frequently made about the indications of nativity or otherwise, as given in the general Floras of Britain, and also of those put forth by some local botanists. It was thus shown that such indications are often in direct contradiction to each other. When not in opposition, the seeming harmony too often had been occasioned by writers copying from one book into another. Dr. Bromfield rightly conjectured the chief reason for adducing those contrasts of opinion. It was seldom done with any idea of attaching much authoritative value to the discordant opinions so brought together. More usually it was done expressly for the purpose of showing that the chance opinions of closet botanists are too contradictory to be of any real value. Such are designated the chance opinions of closet botanists, because too frequently they were put forth by those who had neither seen the localities of the plants, nor had properly examined the evidences on which their decisions ought to have been given.

The attempt of Professor Henslow, in his *Catalogue of British Plants*, dated in 1835, was doubtless much impeded by the imperfect and often erroneous indications given in the general Floras, as well as by the conceal-



ments and omissions by the reporters of localities. And making fair allowance for the then existing state of opinion on the subject, and for the accumulated errors then in print, it is worthy of note that the Professor should have steered his course so well in 1835. What his ideas were at that date will presently be shown in comparison with those of the *Cybele Britannica* and *Manual of British Botany* full twenty years later. Indeed, the Author of the *Manual*, edition of 1856, may in the main be pronounced still considerably below the point already reached by Professor Henslow in 1835. And yet the *Manual* is certainly an improvement, even in this respect, on its predecessors among the descriptive Floras; although there is still ample room for further improvement. Previously to the publication of the *Manual of British Botany* the indications of nativity or non-nativity, in so far as the general Floras were concerned, were little better than idle guesses, usually hazarded without any sufficient qualifications for judgment in their authors.

Various are the grounds upon which the nativity of plants in Britain may be doubted or denied. Very little can usually be known about the pedigrees of plants which are now observed to exist here more or less spontaneously. The doubts and denials are for the most part retrospective inferences, deduced either from old records or from present facts. And as the records and facts vary greatly in their completeness and certainty, the most sincere and cautious seekers for truth may reasonably be expected to differ in the conclusions deduced from them. Thus much appears quite true as a general rule, that botanists of small experience are the most prone to pronounce plants "truly indigenous." If some few among the more advanced botanists have continued to evince a disposition to the like hasty conclusions, this peculiarity

in them will usually be found connected with some want of capacity for correct reasoning, or with some superficiality of judgment, betrayed by inconsistencies and false reasoning in regard to other matters also. This was notably the case with the late Dr. Bromfield; who evinced a very decided bias for pronouncing plants to be true natives, either on slight grounds only, or even against strong reasons for doubt. And while he was rather remarkable for a good store of miscellaneous knowledge about details, that estimable botanist was slenderly endowed with the capacity for sound reasoning. The views of various other English botanists will be shown more in detail some pages forward, reduced into a tabular list.

## 2. *Examples in illustration.*

In former volumes of this work the grounds for doubting the nativity of species were occasionally stated; though they were seldom entered upon in much detail. It was usually found impossible, within any moderate space of text, to examine in detail the various reported localities for doubted plants, and to consider what reasons there might be for deeming them insufficient evidences of true nativity. Some further intimations of the like kind may usefully find place here, by selection of a few species for remark in connexion, whereby to render them in some measure reciprocal comparisons and illustrations.

1. *Corn-field plants.*—Numerous weeds occur among corn and other crops, or elsewhere on ground worked and turned over by human industry. Some of these appear to be merely casual stragglers, seen once or twice in a spot, with no certainty of being again met with in the

same spot. *Trifolium elegans* and *Barkhausia setosa* are plants which have latterly become included in the lists of aliens occasionally found wild in England ; seen one year in one place, another year in another place ; but nowhere permanent, or reappearing on the same ground for a series of years. Apparently their seeds are imported afresh, and are sown intermingled with seeds of the common clover.—*Lolium temulentum* and *Bromus secalinus* have been longer known in our corn fields, and are much more frequently met with. But even these grasses scarcely keep constant hold of the ground ; rather appearing to be re-sown by human hands, along with the seeds of rye or other kinds of corn among which they grow. They thus occupy a position somewhat intermediate between the aliens and colonists.—*Agrostemma Githago* and *Centaurea Cyanus* are more frequent, and also more persistent in the same fields, than the *Lolium* and *Bromus* before named. Apparently they sow and scatter their own seeds ; and thus they may be said to hold their ground without the aid of man, except in so far as his regular preparation of the ground may be requisite for their growth and permanence on it.—*Papaver dubium* and *Chrysanthemum segetum* are highly abundant, and now constantly perpetuate themselves by seeds in cultivated ground ; occasionally also growing on cliffs by the sea, on rubbish heaps, and about quarries. Still, it is at best uncertain, whether even these seemingly well-established species could keep a permanent hold of English ground, if it were not from time to time broken up for them by the industry of man, in preparing for the cultivation of other things more valuable to him. On this account those two familiar plants are classed with the species introduced originally among agricultural seeds, and still needing some aid from mankind for holding a place in



the British flora.—*Sinapis arvensis* and *Galeopsis Tetrahit*, though seen most usually among corn and other crops in the fields, evince much tendency to grow also on hedge-banks and elsewhere. In this manner they assume a second or seemingly native character, in addition to their agrestal and colonist character.—*Anagallis arvensis* and *Filago germanica* seem to be still more capable of maintaining themselves elsewhere, apart from cultivation, and without human aid; although often very abundant among crops, and perhaps most frequently seen on cultivated ground. They are always deemed native plants; but as we pass in a northerly direction, their places of growth assume more and more of an artificial character; and at length, in the Flora of Moray, where the sign of frequency is attached to the names of both, that of doubtful nativity is also added to the former.—*Stellaria media* and *Polygonum aviculare*, also abundant weeds on cultivated lands, are almost equally plentiful in various other situations; and hence no botanist ever questions their original nativity in England.—In these examples we trace the group of colonists, from their first occasional appearance as chance aliens, upwards to the undoubted natives. The intervening grades or steps, between the couplets of plants mentioned by name, might be filled up by other names, in such manner as still more clearly to show that no absolute and certain line can be drawn between them,—either between the aliens and colonists, or between the colonists and natives. Botanists do not agree at what link or step in the series the lines of distinction can or ought to be traced. True, every observer of English vegetation can recognise and admit the different conditions of *Stellaria media* and *Barkhausia setosa*. So far, he recognises and admits the distinctions between natives and aliens. But this does not enable him satisfactorily

to place the several scores of other species, which he sees to be intermediate between these two clear and extreme examples. The colonists and also the denizens come between ;—species about which we cannot agree, whether to accept them as natives, or to reject them as aliens originally ;—species which either now appear to require human operations to fit the ground for their present continuance in Britain, or still appear to have required such aid for their original introduction and establishment, though no longer needing that aid now to retain them here. — This second class, the denizens, are best exemplified among the garden plants ; the first or colonists, by the corn-field plants.

2. *Ornamental garden plants.*— These are liable to be left growing in the sites of old gardens, which have ceased to be cultivated ; and in the lapse of time, after vestiges of adjacent buildings have become indistinct, the plants are mistaken for native productions, by recent observers to whom the former condition of the ground remains unknown. From such sites, and also from gardens still under care, various species may and do spread away by seeds and runners, or by other modes of increase and diffusion. When thrown out as superfluities among refuse from gardens, many roots and capsules of seeds are conveyed to the fields and road sides, or are carried by streams to other situations comparatively remote ; where they grow, and thus gradually become established. Occasionally plants are introduced by design to wild-seeming localities, either with experimental views, or (by guides and dealers) for the purpose of fraud and deception. As a general rule, we may suspect ordinary garden species to have been originally escapes or introductions, if found seemingly wild in only few and isolated places ; and these being spots which either suggest their garden origin, or

are so situate that garden species might easily reach them. Some examples may here again be selected, in order to illustrate this group of doubted natives. *Sempervivum tectorum* and *Linaria Cymbalaria* occur frequently on roofs and walls, but perhaps never on rocks or dry banks far away from houses, unless in spots where they have actually been planted or sown. Their places of growth thus appearing to be always artificial, and the species certainly being often planted in such places for ornament or curiosity, there seems to be strong ground herein for denying their aboriginal nativity in Britain. — *Cheiranthus Cheiri* and *Antirrhinum majus* occur in somewhat similar situations, and under very similar circumstances; extending also occasionally to sea-cliffs, chalk-pits, and other less domestic places. Though short-living plants, and thus requiring to be frequently renewed from seeds, they maintain their position on ruins and other such artificial spots, where left undisturbed; and in so far they may be accounted more naturalised, or more native-seeming, than the two former species. Still, as these also have been long and much cultivated in gardens, and seldom occur except in places to which they might have readily spread from houses or gardens, they are properly suspected not to be truly wild or native species. — *Ornithogalum umbellatum* and *Galanthus nivalis* appear to have become thoroughly established in several places; the latter especially being often seen far away from present houses and gardens, along the courses of streams, in coppices, &c. But they have been very much cultivated as ornamental plants in gardens; and the snowdrop is doubtless often planted for ornament in parks and shrubberies. They increase rapidly by their bulbs, and also renew by self-sown seeds; and they are usually very tenacious in the spots where planted, or where placed by



accidental causes. Most of their localities, in which they are recorded as wild with more or less confidence, are either near existing houses, or about the sites of former houses, or else in spots to which the bulbs might readily have passed from gardens; where their rapid increase leads gardeners to be careless of them, and perhaps often purposely to dig them out as superfluities. And further, they never appear so really wild, and so affecting places remote from the abodes of man, as (for example) the *Hyacinthus nonscriptus* and *Allium ursinum* are observed to be and to do. The proper inference from these facts and conditions appears to be, that the *Ornithogalum* and *Galanthus* are very probably not native in most of their present localities, are doubtful in others, and indisputably native in none. This sort of evidence and inference is most decided against the former. It is somewhat less so against the snowdrop, or at least is thought to be less so by several botanists. — *Vinca minor* and *Sedum reflexum*, plants of a different character in their growth, are well adapted to spread over any favorable spot to which they are carried either by natural causes or by human agency. There can be no reasonable ground for denying that many of their present localities, along hedgerows and near the sites of gardens, have originated through the frequent culture of these species as ornamental garden plants. But some others of their localities are confidently declared by various botanists to be truly natural; those of the periwinkle especially being so regarded. — *Viola odorata* and *Helleborus viridis* seem to have yet clearer claims to be held native in some of their localities; although these two species have certainly been spread to many other places, and have attained a much wider area of distribution, simply as introductions or as escapes from cultivation. Believing them natives in some spots in

England, botanists are unfortunately too ready to report them equally as natives in many other places, where they certainly are not so.—*Polemonium cæruleum* and *Meconopsis cambrica*, while equally traceable back to gardens in many of their present localities, are quite admitted to be genuinely native in some others of them; being there the occupants of wild rocky places, to which they are most unlikely ever to have been transported from gardens. When brought from such native spots into gardens, they seed very freely, and rapidly propagate themselves in a weed-like manner; occasionally passing thence into adjacent wilds, where they may become mistaken for native plants. — Here, again, as in the case of corn-field weeds, we might trace all gradations from the certainly introduced species, like *Sempervivum* and *Cymbalaria*, up to certainly native species, the areas and separate localities of which have been largely increased by human agency, as in the case of the *Meconopsis* and *Polemonium*. But the like difficulty again comes in our way; namely, how to designate many of the intermediate plants, which are supposed natives by botanists A, B, C, and are considered as introduced species by botanists D, E, F.

3. *American species*.—Among the plants now seen wild and well-established in Britain, are some few which can be most confidently placed in the category of aliens. Such are the species which were apparently unknown in Europe before the discovery of America, which are certainly natives of the Western Continent, and concerning which there is evidence, more or less positive, of an introduction into Europe by human agency, whether purposely or accidentally. In Britain we now see a few of these species rapidly naturalising themselves among the natural vegetation of the island. Already some of them are so completely established, as a constituent portion of the

natural vegetation, that they would undoubtedly be regarded as true natives, in the absence of the geographico-historical evidence to the contrary. — *Mimulus luteus* has become thus well established in many places, both in England and Scotland. — *Impatiens fulva* is perfectly established in the county of Surrey, in dotted lines of several miles long; and perhaps through spreading along the course of the Thames river, it is becoming established also in Middlesex. — *Gnaphalium margaritaceum*, a plant of rapid increase by its underground suckers, has been pronounced native in Britain by several botanists, on faith of its apparent wildness in some places; though the correctness of this idea is denied by others, who assert that it was originally introduced from America. — *Lysimachia ciliata* is stated to be likewise establishing itself in various spots, and with sufficient semblance of wildness to lead to mistakes, were its transatlantic origin not certain. — The remarkably rapid increase and diffusion of the recently observed *Anacharis alsinastrum* (*Udora canadensis*) is familiar to all British botanists of the day, though the plant was hardly known to any of them a quarter of a century ago. — *Oenothera biennis* is less permanent, though become a half-wild weed in many spots. — *Barbarea præcox* is now rather supposed than certainly known to have been brought originally from America. — *Erigeron canadense* is occasionally seen about our waysides, on rubbish heaps, and in cultivated ground; although, as implied by its specific name, this plant also is supposed to have been brought from America into Europe, where it is now abundantly diffused in the southerly latitudes, having a summer temperature warmer or longer than that of Britain. — The very imperfectly established *Oxalis stricta*, and the locally well-established *Spartina alterniflora*, are both suspected to have also come from



America. — We may derive an useful hint from the facts concerning these various species. They now occur in England quite as well established among the natural vegetation, as are those of the more numerous group treated under the designation of denizens in this work. Those botanists who regard the denizens as being for the most part true natives of Britain, do so on the ground of their present seeming wildness or spontaneity in certain spots. On the same rule, if their origin had been equally unrecorded, the American species above named would equally have been declared aboriginal natives of Britain,—and yet of course wrongly so declared. How many of the denizens are in this condition? How many even of the reputed natives, through the indications of their foreign origin having become obliterated?

4. *Fruit trees*.—It might well be supposed that some of the trees and shrubs, which have been long and largely cultivated for their fruit, would gradually have become established in England, if not aboriginal natives. And further, there seems no improbability in a supposition, that the descendants of such garden fruits would deteriorate in becoming wild here. Some botanists regard the Pear, Apple, Plum, Cherry, Currant, and Gooseberry, all alike as aboriginal natives of Britain. This appears doubtful in respect to some of them; sufficiently probable or certain in regard to others. *Pyrus Malus* occurs frequently in hedgerows and coppices, in a seemingly wild state; though in such situations it is at any rate liable to some degree of distrust. But trees of great age are found occasionally on hill sides, and also in the scanty remains of truly natural forests. These latter localities go far to warrant our recognition of the Crab-tree or Wilding-apple as a genuine native of England. On the contrary, *Pyrus communis* is far less frequent in the half-wild

localities of hedgerows and coppices, or plantations near houses. And it is perhaps never found as a constituent of the truly natural forests. It is, too, more susceptible to frost than the former species; apparently so in its half-wild state, certainly so in most of its garden varieties. These considerations suggest doubts on the aboriginal nativity of the Pear-tree in England. — *Prunus domestica* is generally allowed not to be a true wilding or native in England. *Prunus spinosa* is fully admitted to be so; and the like remark may be extended to the intermediate variety or species *Prunus insititia*. But the links of connexion between them are so close and gradual, that it becomes highly difficult to show whether the Plum-tree of the gardens, in all its numerous and improved varieties, is truly and permanently distinct as a species from the Bullace and the Sloe. So far as the Plum-tree (*P. domestica*) is concerned, the question of nativity here resolves itself almost into one of specific identity. — The Cherries, *Prunus avium* and *Prunus Cerasus*, are now quite wild; the former much more frequent than the latter. It may be, that the garden varieties are improvements of native species; or it perhaps may be, that the wild varieties are the degenerated descendants of trees imported into our gardens. The former view is the one most generally held by English botanists. — With the single exception of *Ribes rubrum*, in its truly wild variety *R. petraeum*, the several species of *Ribes* ought to be regarded with some degree of distrust in Britain. There cannot be a doubt that many of their alleged localities have originated from seeds of their garden varieties, dispersed by man and animals; and this is true with respect to those of *R. rubrum*, equally with those of other species. In the mountain valleys of North England and Scotland, *R. rubrum* appears to be truly native. But the true indige-

nous area of the species cannot now be pointed out, apart from the extension given thereto through escapes from garden culture. If not a native of the same part of England, *Ribes Grossularia* has become best established there; being scarcely more than an occasional straggler elsewhere. Considering how much the Gooseberry and Currants are cultivated, how freely they are eaten by various birds, and how plentifully they spring up from seeds dropped in gardens and about houses, it seems remarkable that they should be found so sparingly in hedgerows, coppices, stream-sides, and other such situations. They do occasionally occur in scanty numbers in such places; but far more sparingly than might be expected of really native shrubs so much assisted in their dispersion.

5. *Culinary and Medicinal herbs*.—Like the fruit trees and ornamental garden plants, some of these may have been native species brought under cultivation, while others may have been originally imported, and have since become seemingly wild by diffusion from gardens only. The difficulty of finding another origin for *Brassica oleracea*, may help to fix its aboriginal habitat on the coasts of Britain and elsewhere in Western Europe. The inland localities cited for it, such as the rocks about old castles, may be deemed non-native with little doubt or question. Even the sea-cliffs about towns and other buildings may properly be regarded with some suspicion, when cited as the natural localities of a plant so abundantly and anciently cultivated.—*Smyrnum Olusatrum* occurs under conditions and in places very similar to those where the Cabbage grows. Though now seldom or never cultivated for use, it still lingers about old buildings, and often in abundance, near to which it likely enough was cultivated in former years. It may indeed



have truly native localities on rocks and banks about the coast.—*Petroselinum sativum* is cultivated in every garden; springing up profusely from self-sown seeds. It has become established on the sea-cliffs in various places; and it is seen occasionally about the sites of former gardens inland. Some English botanists have in consequence reported it native; but the greater number of them more correctly consent to regard it as an introduced species, naturalised by escape from gardens.—*Melissa officinalis* is always allowed to be an alien, although recorded as if now becoming established in some spots.—*Marrubium vulgare* is seldom questioned; yet many of its localities are highly to be suspected. A few plants of it, scattered about old farm houses and other country abodes, often represent a recorded locality.—*Atropa Belladonna* is supposed to be native in some calcareous tracts; but many of its localities have a very suspicious proximity to old abbeys and monasteries.

6. *Way-side plants, &c.*—The greater number of suspected species belong to the categories of corn-field weeds and garden plants. Some few others of them are seldom or never seen as weeds among field crops, are seldom or never cultivated in gardens. If not native they may have been accidentally introduced among ballast thrown ashore from ships, or intermingled with merchandize of various kinds. Examples are mentioned in the valuable Flora of Hertfordshire, by the Rev. Messieurs Webb and Coleman, of species probably introduced to that county among seeds of flax and cole, brought to the Oil-mills. The ballast deposited in the provinces of Tyne and Humber, by returned coal-vessels, has furnished species to lengthen the list of nominally English plants in those provinces. And botanic gardens have done some little in this way, by introducing weed-like species which might

otherwise not have been cultivated in England, as the *Senecio squalidus* and *Sisymbrium polyceratium*. Even botanical herbaria may have been the introducing source of some occasional stragglers. M. De Candolle suspects the fully established *Rumex pulcher* and *Polygonum Convolvulus*, and also several of the *Chenopodia*, to be of foreign origin in Britain; ideas which may rather surprise those English botanists who are so averse to the elimination of doubted species from our native flora. The same Botanist also thinks, with much probability of correctness here, that *Coronopus didyma* and *Mercurialis annua* are only naturalised aliens in England. But the views of the illustrious Botanist of Geneva will be specially mentioned under succeeding sections.

### 3. Views of M. Alphonse De Candolle.

In the second volume of the *Geographie Botanique* M. Alphonse De Candolle gives his results from a close examination of the three earlier volumes of the *Cybele Britannica*, made with especial reference to the conflicting opinions about the aboriginal nativity of the species in Britain, or their introduction into this country by human agency. He compares together the recorded opinions of English botanists, and also takes largely into account the apparent conditions of the same species on the Continent of Europe; adding thereto such other evidences of a less direct kind, chiefly philological and biblical, as may be conceived likely to throw any light upon this obscure subject. He then gives his readers the benefit of his own views, founded upon an examination and comparison of the various data thus brought together.

Under these circumstances, it seems to be well worth while to devote some pages to an exposition of the views

entertained, after long and careful investigation of the subject, by a botanist so deservedly inheriting and supporting a name of world-wide celebrity. Before giving his views in regard to individual species, which is intended to be done presently for the sake of comparison with those intimated in the *Cybele*, it may be well to make some comments on the method pursued by M. De Candolle, and to inquire how far it is calculated to lead him to satisfactory conclusions.

The distinction between original natives and introduced species, is one of primary importance in geographical botany. On this account the modes and indications resorted to, for separating plants into the two classes, require to be well considered and agreed upon. Botanists cannot yet be said to have fixed rules; although the course of investigation followed by M. De Candolle in his inquiries, does in some measure prescribe such rules or assumed principles. The present writer and M. De Candolle are clearly somewhat opposed in the comparative value or importance which they attach to the rules so set forth by the latter. They differ in regard to the data or evidences on which a reliance should be chiefly placed, in attempting to decide whether given species are native or otherwise in England and elsewhere.

For example, M. De Candolle arrives at some of his conclusions, by comparing together the opinions of different English botanists. When those opinions are alike, they may then be held evidences entitled to attention. But when those opinions conflict, how can a foreigner then decide between them? He must attempt to do so under great disadvantages, in not being sufficiently aware of the relative degree of trust which ought to be given to the statements and inferences of different botanists here. These disadvantages appear to affect unfavorably the



conclusions of M. De Candolle in many instances. Not only is there much difference in the fidelity and accuracy with which botanists record their facts, real or supposed, but there are perhaps still more important differences in their capacities for rightly understanding what they do see, and of deducing correct conclusions therefrom. When a botanist records the finding of a suspected species "on ruins," and forthwith adds also that the locality was "far from any house,"—under the apparent wish of leading his readers to concur with him, in supposing the plant a true native there,—in such an instance, the blunder or false inference is so obvious as to become harmless. But there are many hundreds of records in English books, which are either logically unsound or actually untrue, though less obviously so; and many of which could be detected by no foreigner, and even by few English botanists.

An Englishman who has specially attended to this subject through a series of years, and who has thus obtained opportunities for seeing many thousands of specimens labelled by British botanists,—who has examined and collated tens of thousands of recorded localities for plants,—and who has in divers instances compared the actual localities with the printed records of them,—must judge under advantages to which it is quite impossible for any foreigner to attain. He ought to be in a much better position for judging how far the individual botanists A, B, C, D, &c. are to be relied upon;—relied upon, not only for stating their facts clearly and correctly, but also for doing this completely, by the non-omission of circumstances which may bear importantly upon the proper conclusions to be deduced from the facts.

It is on this account objected to some of M. De Candolle's views, in regard to the nativity or non-nativity of certain species, that the facts themselves do not warrant

those views, although the published statements and opinions of A or B or C may to a foreigner fully appear to do so. Examples were occasionally adduced in former volumes of this work, in order to exhibit that want of veracity, or want of carefulness, or want of clear-sightedness, which together have introduced so much that is fallacious or positively false into our botanical records. Such examples, by no means all that could have been adduced, may be found under the dozen species named in the annexed list; and truth-seeking botanists will do well to read and ponder them:—

*Delphinium Consolida*, vol. 1, p. 97; vol. 3, p. 377.

*Koniga maritima*, volume 1, page 134.

*Oxalis stricta*, vol. 1, p. 272; vol. 3, p. 403.

*Geranium striatum*, volume 1, page 258.

*Sempervivum tectorum*, volume 1, page 403.

*Achillea tomentosa*, vol. 2, p. 133; vol. 3, p. 463.

*Gentiana acaulis*, volume 2, page 168.

*Lysimachia ciliata*, volume 2, page 298.

*Tulipa sylvestris*, volume 2, page 449.

*Cynodon Dactylon*, volume 3, page 145.

*Lagurus ovatus*, volume 3, page 182.

*Cynosurus echinatus*, volume 3, page 214.

Secondly, in deciding upon the claims of plants to be deemed native or otherwise in Britain, M. De Candolle is greatly guided by the records of their occurrence in neighbouring portions of the Continent,—in Scandinavia, Netherlands, West Germany, and North-west France. Such records may well be admitted as valuable secondary and corroborative evidence, which can usefully be adduced in support of more direct proofs. But they must be held of less authority when brought forward against any primary and positive evidence, afforded by the actual conditions under which the species are observed in Britain itself.

An illustration of what is here intended may render the argument more clear. A good "Geographico-Botanical Disquisition" on the plants of Holland was published by Dr. Miquel in 1837. In that work its learned Author enumerates several species which are deemed natives of the Netherlands and Hanover, but which have not been recognised as belonging to the flora of England. If any of those species should occasionally be found in doubtful situations in England, it is still contended that the inferences of foreign origin, as drawn from the primary evidence afforded by their actual conditions in England, would not be either overbalanced or set aside by the antecedent probability of finding them wild here, because they are stated to grow wild in Holland and Hanover.

If relying upon such foreign records, in preference over the facts themselves as they appear in Britain, we ought to admit the nativity of *Saponaria vaccaria*, *Coronilla varia*, *Hyssopus officinalis*, and various other plants, hitherto not acknowledged as being really British, although they have actually been found in one or more places in England. Nor is it easy to see, if relying upon the indirect evidence, to the extent which M. De Candolle seems disposed to rely on it, how we could reject *Globularia vulgaris*, *Lotus siliculosus*, *Galega officinalis*, *Cynanchum vincetoxicum*, and many other plants on record for Western Europe, if they should hereafter be found in Britain anywhere outside the fences of a garden.

A more special example, taken from the work of M. De Candolle himself, may further serviceably illustrate the differences adverted to. He allows that *Anemone apennina* is only a naturalised plant in Britain; but he does not see reasons sufficient for believing the rarer and less-established *Anemone ranunculoides* to be so likewise. He states that the latter species is found in Scandinavia,



Denmark, Netherlands, and Northern France ;—therefore, why not in England ? We may allow that its occurrence along Western Europe, in latitudes corresponding with Britain, would give an antecedent probability or expectation that it might also occur wild in Britain. Still, such a mere expectation is no real evidence to be set against the conditions, natural or artificial, under which the species is truly found in this country. And it is at any rate mainly on the evidence afforded by those conditions, that we ought to decide as to its native origin or otherwise. Notwithstanding the antecedent probability in this instance, there seems to be abundant reason for doubting the true nativity of the *Anemone ranunculoides* in England, when we find that the three most reliable records locate the plant in or near gardens only. Thus, the Herts locality is described as being “on the lawn in front of a house, not far from the church at Abbots Langley” (Mr. Hincks). In Staffordshire, it was observed “growing plentifully about the lawn at Steepenhill Vicarage, with *Galanthus nivalis*” (Mr. Borrer). In Yorkshire, it is “naturalised near a garden at Evingham” (Mr. Backhouse). For the other four or five counties we have no sufficient information about the kind of situations in which the plant was found ; nor is it quite certain that the species found was rightly named in all of these latter counties. Here, it may be contended, that the facts about the species in Britain are adverse to the idea of *A. ranunculoides* being truly native ; and that while no better evidences are adduced for Britain, the fact of nativity elsewhere ought not to warrant an inclusion of the species among our undisputed natives.

A second example may be added, in which such records directly oppose the opinion avowed by M. De Candolle, in regard to a reputed British plant ; perhaps thus

opposing an opinion that is in itself correct. In reliance on the general Floras of Britain, and on the statements of several local observers, *Stratiotes aloides* was treated in the second volume of this work as an unquestioned native of Britain. It is enumerated as such also for Holland in the Disquisition of Dr. Miquel. But M. De Candolle, with much probability, considers this tropical-seeming plant as having been originally brought from Southern Asia. Now, in this instance, would the Author of the Geographie allow any force to the following style of argument? — Recorded also in Holland; therefore a true native of Britain. Or, conversely, Recorded also in Britain; therefore a true native of Holland.

These two examples may have their usefulness in suggesting to readers, who are less conversant in such matters, the need of much caution in deciding upon the condition of a species in one country, by examining the records of its condition in another; especially so if the two countries are disjoined by the present seas. In regard to the vegetation of England, the two facts (first) of the seeming nativity of a species on the Continent, and (second) its seeming non-nativity in England, lead together to an important problem in geographical botany. To take the first datum as a negation of the second datum, is surely a solution of the problem more light than logical?

A third kind of evidence, to which M. De Candolle attaches considerable value, is that derived from the terms in which Authors have described the usual situations for the species, whether agrestal, viatical, pratal, &c. If he finds plants only described as occurring "inter segetes," or in other agrestal situations, he deems them not shown to be native or even properly naturalised species. The more they are recorded beyond these and

other such artificial situations, the more probable he deems their nativity to be. No doubt there is good discrimination in hitting upon this test, provided it be not carried too far, but be kept strictly within the bounds which the actual practices of botanical writers may warrant. It may be said that such indications ought to be good evidence; and in some future age they may possibly become so. But their present value, as tests of nativity, will vary greatly with different Authors; and they can perhaps very rarely be relied upon with much confidence. As a prevailing custom, Authors of Floras do not seem to be very particular about stating all the situations in which species occur; rather indicating those in which they have been observed most frequently or most conspicuously; and occasionally it is only the one situation indicated on the label of a dried specimen.

A notice of the kind of places or situations in which species usually occur, was evidently deemed important to geographical botany in the former volumes of the *Cybele Britannica*. This is shown by the endeavour to form a series of single terms for expressing those situations. But their diversity in the case of many species, and the consequent difficulty of comprehending all of them under one or two of those terms, were alluded to in the paragraph immediately following the series of terms proposed (volume 1, page 66). In treating the individual species, there was little endeavour to be exhaustive, by repeating all the terms which might occasionally be applicable to a plant. The object sought was rather that of indicating the usual situations of the species; the abbreviation "&c." being sometimes added, in order to remind readers that the term or terms applied were not to be regarded as exhaustive. Now, it may be asked, if a writer on geographical botany thus almost unavoidably



stops short of enumerating all the situations in which given species occur, is it not highly probable that other writers, whose object was rather descriptive than geographical botany, have frequently done the same? And the doubt implied by the question seems to be especially needful with regard to those authors who wrote in years long past, when such matters were less attended to than is the case in our own time? Even yet they are very imperfectly attended to; the situations of plants being often stated incorrectly, and very often incompletely.

Omissions are perhaps more usual in Floras relating to countries of large extent. Authors of very local Floras not seldom err in a contrary direction, by transcribing from larger works, and not sufficiently considering whether the transcribed situations do truly indicate those of their own locality. Dr. Bromfield's *Flora Vectensis* is very faulty in this respect; the author repeatedly stating situations for the species, such as they do not inhabit within the limits of his Flora; although it may be true that elsewhere, as in other parts of England or the Continent, he might have seen them in such situations. Examples where the situations of growth, as indicated in the *Flora Vectensis*, cannot be those of the Isle of Wight solely and exclusively, may be seen by reference to those given for *Thlaspi arvense*, *Erodium moschatum*, *Sedum album*, *Atropa Belladonna*, *Mentha sylvestris*, *Teucrium Chamædrys*, &c. And yet M. De Candolle has relied much upon the statements and arguments of the late Dr. Bromfield, when judging about the nativity of species in Britain. It is certainly true that Dr. Bromfield wished and endeavoured to be accurate, and that he had a fair appreciation of what is required in geographical botany. But it has previously been remarked, that the character of his intellect was far from

logical. His attempts at reasoning were often superficial and unsound, and his arguments irrelevant. Even in recording facts, and in matters of simple observation, his statements were occasionally inconsistent and self-contradictory. He was one of the authors by whom a foreigner would be misled, if relying too implicitly on his writings; although a discerning English botanist may derive useful hints and information therefrom.

But Dr. Bromfield is not alone. Other English writers have so described the situations of plants, as almost certainly to mislead, if their indications should be trusted as given with perfect accuracy or with exhaustive completeness. Some additional examples of this will not be space wasted, if they are received as suggestive hints for greater exactness on the part of future writers. In the second volume of this work *Polygonum Persicaria* is entered as "agrestal, inundatal;" and *Polygonum lapathifolium* is designated "agrestal, inundatal, &c." In Babington's Manual of British Botany both species are located alike, "in waste and damp places." Assuming these indications to be correct, the two species are found in similar situations in Britain; the second rather more varied in its situations, perhaps, than the first. If we next turn to the English Flora of Smith, — not a careless writer or a despised work, — we shall find the situations of the two species very differently described. *Polygonum Persicaria* is there stated to occur "in ditches, wet fields, and watery places, common"; and the *Polygonum lapathifolium* is indicated "in cultivated ground, especially such as is rich and moist, and on dung-hills."

How would these differences of indication influence the foreign phyto-geographer, who should rely upon them as tests of nativity or non-nativity of the two species in Britain? Looking to the Cybele or to the Manual, he

might believe that both species occur under similar conditions, and that they are thus equally entitled to be called natives ; namely, on faith of the second term and form of expression used, “inundatal” and “damp places,” in addition to cultivated ground. But if he should look to the English Flora, with the eyes of M. De Candolle, he must pronounce the *P. Persicaria* to be undoubtedly native ; while he should hold the *P. lapathifolium* as evidently introduced, and even still very imperfectly naturalised.

The English Flora is a publication of older date (1824—1828) than those chiefly referred to in the *Geographie Botanique* for ascertaining the actual condition of plants in Britain. But it will be easy to prove that very recent authors, up to the date of M. De Candolle’s own volumes, have followed no regular rule or principle in giving such indications. The annexed two series of indications (pages 94, 95) are taken from the third edition of Babington’s *Manual of British Botany* ; a work frequently, and not undeservedly, quoted in the *Geographie Botanique*. The third edition is the one immediately preceding the date of M. De Candolle’s great work. The first of the two series contains the names of twenty-five species which are considered by M. De Candolle to have been introduced into Britain, more or less certainly so ; and in his view only few of them ought even yet to be held fully naturalised. The second series consists of an equal number of species, the nativity of which is unquestioned by English botanists, except in very few instances ; and in the questioned instances M. De Candolle has decided more or less confidently in favour of their nativity. By taking these fifty species in pairs, as numbered, it will be seen that their situations of growth are described in almost the same manner for the (presumed) Introductions



1. *Species introduced to Britain (A. De Candolle, &c.) ;—with the indications of station from Manual, 3rd edition.*

1. *Fumaria officinalis*. Common.
2. *Valerianella Auricula*. Cultivated land.
3. *Polygonum Convolvulus*. Cultivated and waste land.
4. *Euphorbia Helioscopia*. Waste and cultivated land.
5. *Mercurialis annua*. Waste and cultivated land.
6. *Valerianella olitoria*. Corn-fields and banks.
7. *Melampyrum arvense*. Corn-fields and dry banks.
8. *Fumaria micrantha*. Fields.
9. *Scandix Pecten Veneris*. Fields.
10. *Euphorbia platyphyllus*. Fields.
11. *Papaver hybridum*. Sandy fields.
12. *Apera Spica-venti*. Sandy fields.
13. *Silene noctiflora*. Sandy and gravelly fields.
14. *Linaria minor*. Sandy and gravelly fields.
15. *Antirrhinum Orontium*. Dry sandy and gravelly fields.
16. *Ajuga Chamæpitys*. Sandy and chalky fields.
17. *Geranium pyrenaicum*. Road-sides and pastures.
18. *Lycopsis arvensis*. Fields and hedges.
19. *Scrophularia vernalis*. Waste places.
20. *Rumex pulcher*. Dry waste places.
21. *Asperugo procumbens*. Rich waste ground.
22. *Anthemis Cotula*. Fields and waste places.
23. *Filago gallica*. Dry gravelly places, very rare.
24. *Medicago falcata*. Sandy and gravelly places.
25. *Melilotus vulgaris*. Sandy and gravelly places near the sea.

and for the (presumed) Natives. Consequently, such records in descriptive works are so far shown to be no real and safe tests, by which to separate the native and introduced plants of this country, or to distinguish the non-naturalised species from the rest.

Such illustrations might be increased to a large extent from botanical writings, and from the works of foreigners as well as from those of English botanists. But without occupying more pages with them here, it is conceived that examples enough have been adduced, for the pur-

2. *Species reputed native in Britain ; — with the indications of station from Manual, edition 3.*

1. *Stellaria media*. Common.
2. *Æthusa Cynapium*. Cultivated land.
3. *Sinapis alba*. Cultivated and waste land. (A. De C.)
4. *Lapsana communis*. Waste and cultivated land.
5. *Lamium purpureum*. Waste and cultivated ground.
6. *Bartsia Odontites*. Corn-fields and waste places.
7. *Cerastium glomeratum*. Fields and banks.
8. *Knautia arvensis*. Fields.
9. *Chrysanthemum Leucanthemum*. Fields.
10. *Cerastium triviale*. Fields.
11. *Scleranthus annuus*. Sandy fields.
12. *Muscari racemosum*. Sandy fields. (A. De C.)
13. *Silene anglica*. Sandy and gravelly fields.
14. *Arnoseris pusilla*. Gravelly and sandy fields, rare.
15. *Alchemilla arvensis*. Dry fields on sand and gravel.
16. *Linum angustifolium*. Sandy and chalky places.
17. *Thlaspi arvense*. Fields and road-sides. (A. De C.)
18. *Myosotis arvensis*. Cultivated land and thickets.
19. *Arctium minus*. Waste places.
20. *Cynoglossum officinale*. Waste ground.
21. *Diplotaxis muralis*. Waste ground. (A. De C.)
22. *Plantago major*. Fields and waste places.
23. *Filago minima*. Dry sandy and gravelly places.
24. *Veronica arvensis*. Gravelly and sandy places.
25. *Erodium maritimum*. Sandy and gravelly places, particularly near the sea.

pose of showing how uncertain may be any conclusions respecting the nativity and naturalisation of plants in Britain, which are deduced from such notices and records. It is not because the suggestions of M. De Candolle are in themselves deemed to be unphilosophical, that exception is thus taken against their application to the botany of Britain ; but because the data placed on record by other authors, — most of them writing for descriptive rather than geographical botany, — are too inexact and empirical, to admit of that full reliance being

given to them, which is essential in the style of argument resorted to by M. De Candolle. The term "situation" is here used for the kind or sort of places in which plants occur. The word "station" is current among Continental botanists, and must probably be adopted by those of England, though not so applicable in our language. We ordinarily mean the exact or special spot, rather than the kind of place, by the word "station"; as when speaking of a railway-station, or police-station, or viewing station, &c.

In the subjoined list of introduced and dubiously native species, it is endeavoured to institute a comparison between the conclusions drawn by M. De Candolle and those given in this work, on the nativity of the species. In regard to several of them it is not easy to reduce the views of M. De Candolle to the brevity of one or two words set in column, without risk of giving those views somewhat incorrectly, or at least in terms too little qualified; because the Author of the *Geographie Botanique* often balances the opinions of others, without stating his own in explicit terms. His primary object was to select a list of species which could be regarded as "either certainly or probably naturalised" in Britain. In the *Geographie* these are distinguished by a difference of type, and may be known in the subjoined list by the single term "Naturalised." But from these, it must be recollected, M. De Candolle excludes the corn-field or agricultural weeds as being not yet actually naturalised. The word "Introduced" is used for such species, the colonists of the present work, and for various others which are known or supposed to be of foreign origin.

The first column of the List includes the names of all the species, which are more or less strongly suspected to



owe their existence in Britain to human agency; some few very uncertain stragglers, seldom mentioned in books, being omitted. The second column repeats the terms applied to the species in former volumes of this work; an (enclosed) abbreviation being added occasionally, in order now to suggest a change to another term, instead of the one before applied. The third column shows the opinion of M. De Candolle compressed into one or two words, so far as this can be done from the remarks made on the plants in the *Geographie Botanique*.

Distrusted Species.	Cybele, 1, 2, 3 (4).	<i>Geographie Botanique</i> .
<i>Anemone apennina</i> .	Alien.	Naturalised.
<i>ranunculoides</i> .	Alien.	Probably native.
<i>Adonis autumnalis</i> .	Colonist.	Introduced.
<i>Ranunculus arvensis</i> .	Colonist.	Introduced.
<i>Eranthis hyemalis</i> .	Alien.	Introduced.
<i>Helleborus viridis</i> .	Denizen.	Probably native.
<i>scetidus</i> .	Denizen.	Probably native.
<i>Delphinium Consolida</i> ?	Colonist.	Introduced.
<i>Aconitum Napellus</i> .	Denizen.	Naturalised.
<i>Pæonia corallina</i> .	Den. (Aln.)	Naturalised.
<i>Berberis vulgaris</i> .	Denizen.	Probably native.
<i>Epimedium alpinum</i> .	Alien.	
<i>Papaver hybridum</i> .	Colonist.	Introduced.
<i>Argemone</i> .	Colonist.	Introduced.
<i>dubium</i> .	Colonist.	Introduced.
<i>Rhœas</i> .	Colonist.	Introduced.
<i>somniferum</i> .	Alien?	Introduced.
<i>Chelidonium majus</i> .	Denizen.	Probably native.
<i>Glaucium violaceum</i> .	Alien.	Introduced.
<i>Corydalis lutea</i> .	Alien.	Naturalised.
<i>solida</i> .	Alien.	Introduced.
<i>Fumaria capreolata</i> .	Native?	Introduced.
<i>officinalis</i> .	Native?	Introduced.
<i>micrantha</i> .	Native?	Introduced.
<i>parviflora</i> .	Native?	Introduced.
<i>Vaillantii</i> .	Native?	Introduced.

	Cybele.	Geographie.
<i>Crambe orientalis</i> .	Alien.	Introduced.
<i>Coronopus didyma</i> .	Nat. (Den.)	Naturalised.
<i>Isatis tinctoria</i> .	Alien.	Naturalised.
<i>Thlaspi arvense</i> .	Colonist.	Probably native.
<i>Iberis amara</i> .	Colonist.	Introduced.
<i>Lepidium latifolium</i> .	Native ? (!)	Doubtless native.
<i>Draba</i> .	Alien.	Introduced.
<i>rudérale</i> .	Nat. (Den.)	
<i>sativum</i> .	Alien.	
<i>Armoracia rusticana</i> .	Alien.	Naturalised.
<i>Camelina sativa</i> , &c.	Aliens.	Introduced.
<i>Koniga maritima</i> .	Alien.	Naturalised.
<i>Alyssum calycinum</i> .	Alien.	Naturalised.
<i>Arabis Turrita</i> .	Alien.	Naturalised.
<i>Barbarea præcox</i> .	Alien.	Probably native.
<i>Sisymbrium Irio</i> .	Denizen.	Old native.
<i>polyceratium</i> .	Alien.	Naturalised.
<i>Erysimum cheiranthoides</i> .	Col. (Den.)	Probably native.
<i>virgatum</i> .	Alien.	Introduced.
<i>orientale</i> .	Alien.	Introduced.
<i>Cheiranthus Cheiri</i> .	Alien.	Naturalised.
<i>Mathiola incana</i> .	Denizen.	Perhaps native.
<i>Malcolmia maritima</i> .	Alien.	Introduced.
<i>Hesperis matronalis</i> .	Alien.	Perhaps native.
<i>Brassica oleracea</i> .	Denizen.	Old native.
<i>campestris</i> .	Colonist.	Introduced.
<i>Rapa</i> .	Cult. var.	
<i>Napus</i> .	Colonist.	Introduced.
<i>Sinapis alba</i> .	Colonist.	Probably native.
<i>tenuifolia</i> .	Denizen.	Probably native.
<i>muralis</i> .	Denizen.	Probably native.
<i>Raphanus Raphanistrum</i> .	Colonist.	Introduced.
<i>Reseda fruticulosa</i> .	Alien.	
<i>Phyteuma</i> .	Alien.	
<i>Viola odorata</i> .	Den. (Nat.)	Native.
<i>Dianthus Armeria</i> .	Native (?)	
<i>plumarius</i> .	Alien.	Naturalised.
<i>Caryophyllus</i> .	Alien.	Naturalised.
<i>Saponaria officinalis</i> .	Denizen.	Naturalised.

	Cybele.	Geographie.
<i>Saponaria vaccaria.</i>	Alien.	Introduced.
<i>Cucubulus baccifer.</i>	Alien.	Introduced.
<i>Silene italica.</i>	Aln. (Den.)	Naturalised.
<i>noctiflora.</i>	Colonist.	Introduced.
<i>Lychnis Githago.</i>	Colonist.	Introduced.
<i>Linum usitatissimum.</i>	Alien.	
<i>Malva verticillata.</i>	Alien.	Introduced.
<i>Althæa hirsuta.</i>	Alien.	Naturalised.
<i>Tilia parvifolia.</i>	Denizen.	Perhaps native.
<i>europæa.</i>	Alien ?	Perhaps native.
<i>grandifolia.</i>	Alien ?	Perhaps native.
<i>Hypericum calycinum.</i>	Alien.	Introduced.
<i>Acer Pseudoplatanus.</i>	Alien ? (!)	Naturalised.
<i>Erodium moschatum.</i>	Den. (Nat.)	
<i>Geranium striatum.</i>	Alien.	
<i>phœum.</i>	Alien.	Perhaps native.
<i>pyrenaicum.</i>	Denizen.	Naturalised.
<i>Impatiens Noli.</i>	Native ?	
<i>fulva.</i>	Alien.	Naturalised.
<i>Oxalis corniculata.</i>	Den. (Aln.)	Naturalised.
<i>stricta.</i>	Alien.	Introduced.
<i>Staphylea pinnata.</i>	Alien.	
<i>Ononis reclinata.</i>	Alien.	Naturalised.
<i>Medicago sativa.</i>	Alien.	Introduced.
<i>sylvestris.</i>	Denizen.	Introduced.
<i>falcata.</i>	Denizen.	Introduced.
<i>denticulata.</i>	Nat. (Den.)	
<i>Melilotus officinalis.</i>	Denizen.	Probably native.
<i>arvensis.</i>	Denizen.	
<i>vulgaris.</i>	Aln. (Den.)	Introduced.
<i>Trifolium elegans.</i>	Alien.	Introduced.
<i>resupinatum.</i>	Alien.	
<i>stellatum.</i>	Alien.	Introduced.
<i>tomentosum.</i>	Alien.	
<i>Scorpiurus subvillosus.</i>	Alien.	Introduced.
<i>Eathyrus Aphaca.</i>	Nat. (Den.)	
<i>hirsutus.</i>	Native ?	
<i>latifolius.</i>	Alien.	Perhaps introduced.
<i>Prunus avium.</i>	Denizen.	



	Cybele.	Geographie.
<i>Spiræa salicifolia.</i>	Alien.	
<i>Fragaria elatior.</i>	Alien.	Doubtful.
<i>Rosa cinnamomea.</i>	Alien.	Introduced.
<i>lucida.</i>	Alien.	
<i>Mespilus germanica.</i>	Denizen ?	
<i>Pyrus communis.</i>	Denizen.	
<i>domestica.</i>	Alien.	
<i>Ænothera biennis.</i>	Alien.	Naturalised.
<i>Tamarix anglica.</i>	Alien.	
<i>Claytonia perfoliata.</i>	Alien.	Naturalised.
<i>Ribes nigrum.</i>	Denizen.	Native.
<i>Grossularia.</i>	Denizen.	Native.
<i>Sedum dasyphyllum.</i>	Alien ?	Naturalised.
<i>album.</i>	Aln. (Den.)	Naturalised.
<i>sexangulare.</i>	Alien ?	
<i>reflexum.</i>	Nat. (Den.)	
<i>Sempervivum tectorum.</i>	Alien.	Naturalised.
<i>Saxifraga Geum.</i>	Alien.	
<i>umbrosa.</i>	Alien ?	
<i>Eryngium campestre.</i>	Aln. (Den.)	Perhaps native.
<i>Astrantia major.</i>	Alien ?	Naturalised.
<i>Smyrnium Olusatrum.</i>	Denizen ?	Probably native.
<i>Petroselinum sativum.</i>	Alien.	Naturalised.
<i>Ægopodium Podagraria.</i>	Native ?	
<i>Carum Carui.</i>	Aln. (Den.)	Probably native.
<i>Bupleurum falcatum.</i>	Alien ?	Probably native.
<i>rotundifolium.</i>	Colonist.	Introduced.
<i>Fœniculum vulgare.</i>	Native ?	Native.
<i>Peucedanum Ostruthium.</i>	Alien ?	Probably native.
<i>Tordylium maximum.</i>	Denizen.	Perhaps native.
<i>Caucalis daucoides.</i>	Colonist.	Introduced.
<i>Turgenia latifolia.</i>	Col. (Aln.)	Introduced.
<i>Torilis infesta.</i>	Nat. (Col.)	
<i>Scandix Pecten.</i>	Colonist.	Introduced.
<i>Anthriscus Cerefolium.</i>	Alien.	Introduced.
<i>Myrrhis odorata.</i>	Denizen.	Naturalised.
<i>Coriandrum sativum.</i>	Alien.	Naturalised.
<i>Sambucus Ebulus.</i>	Denizen.	Probably native.
<i>Lonicera Caprifolium.</i>	Alien ?	Naturalised.

	Cybele.	Geographie.
<i>Lonicera Xylosteum.</i>	Nat. (Alu.)	Naturalised.
<i>Galium tricorné.</i>	Colonist.	Undecided.
<i>Vaillantii.</i>	Colonist.	Undecided.
<i>Asperula taurina.</i>	Alien.	Naturalised.
<i>arvensis.</i>	Alien.	Introduced.
<i>Centranthus ruber.</i>	Alien.	Naturalised.
<i>Calcitrapa.</i>	Alien.	Introduced.
<i>Valeriana pyrenaica.</i>	Alien.	Naturalised.
<i>Fedia olitoria.</i>	Nat. (Den.)	Introduced.
<i>carinata.</i>	Den. (Aln.)	Introduced.
<i>Auricula.</i>	Colonist.	
<i>dentata.</i>	Colonist.	
<i>Tragopogon porrifolius.</i>	Den. (Aln.)	Naturalised.
<i>Lactuca Scariola.</i>	Native ?	Undecided.
<i>Hieracium aurantiacum.</i>	Alien.	Naturalised.
<i>amplexicaule.</i>	Alien.	Introduced.
<i>Barkhausia setosa.</i>	Alien.	Introduced.
<i>Carduus Marianus.</i>	Den. (Aln.)	Naturalised.
<i>Onopordum Acanthium.</i>	Native ?	
<i>Centaurea montana.</i>	Alien.	Introduced.
<i>Cyanus.</i>	Colonist.	Introduced.
<i>solstitialis.</i>	Alien.	Introduced.
<i>Gnaphalium margaritaceum.</i>	Den. (Aln.)	Naturalised.
<i>luteo-album.</i>	Alien.	
<i>Filago gallica.</i>	Col. (Aln.)	Introduced.
<i>Petasites albus.</i>	Alien.	Naturalised.
<i>fragrans.</i>	Alien.	Naturalised.
<i>Erigeron canadensis.</i>	Alien.	Naturalised.
<i>Senecio squalidus.</i>	Alien.	Naturalised.
<i>saracenicus ?</i>	Denizen.	Probably native.
<i>Doronicum Pardalianches.</i>	Alien.	Probably native.
<i>plantagineum.</i>	Alien.	Probably native.
<i>Chrysanthemum segetum</i>	Colonist.	Introduced.
<i>Pyrethrum Parthenium.</i>	Denizen.	Naturalised.
<i>Anthemis tinctoria.</i>	Alien.	Introduced.
<i>arvensis.</i>	Nat. (Col.)	
<i>Cotula.</i>	Nat. (Col.)	Undecided.
<i>Achillea tomentosa.</i>	Nat. (Aln.)	Introduced.
<i>tanacetifolia.</i>	Nat. (Aln.)	Introduced.

	Cybele.	Geographie.
<i>Xanthium Strumarium</i> .	Alien.	Perhaps native.
<i>Campanula Rapunculus</i> .	Denizen.	Probably native.
<i>persicifolia</i> .	Alien.	
<i>Specularia hybrida</i> .	Nat. (Col.)	Introduced.
<i>Vinca minor</i> .	Denizen.	Native.
<i>major</i> .	Alien.	Naturalised.
<i>Cuscuta Epilinum</i> .	Col. (Aln.)	
<i>Trifolii</i> .	Colonist ?	Introduced.
<i>corymbosa</i> .	Alien.	
<i>Atropa Belladonna</i> .	Denizen.	
<i>Datura Stramonium</i> .	Alien.	Naturalised.
<i>Physalis Alkekengi</i> .	Alien.	
<i>Lycium barbarum</i> .	Alien.	
<i>Verbascum Blattaria</i> .	Denizen.	
<i>virgatum</i> .	Denizen.	
<i>phœniceum</i> .	Alien.	
<i>Veronica Buxbaumii</i> .	Aln. (Col.)	Naturalised.
<i>Melampyrum arvense</i> .	Nat. (Col.)	Introduced.
<i>Scrophularia vernalis</i> .	Den. (Aln.)	Naturalised.
<i>Antirrhinum majus</i> .	Alien.	Naturalised.
<i>Orontium</i> .	Nat. (Col.)	Introduced.
<i>Linaria Cymbalaria</i> .	Alien.	Naturalised.
<i>spuria</i> .	Nat. (Col.)	Introduced.
<i>Elatine</i> .	Nat. (Col.)	Introduced.
<i>purpurea</i> .	Alien.	Naturalised.
<i>supina</i> .	Alien.	Naturalised.
<i>minor</i> .	Nat. (Col.)	Introduced.
<i>Mimulus luteus</i> .	Alien.	Naturalised.
<i>Orobanche ramosa</i> .	Alien ? (!)	
<i>Acanthus mollis</i> .	Alien.	Naturalised.
<i>Salvia pratensis</i> .	Denizen.	Perhaps native.
<i>Mentha sylvestris</i> .	Native (?)	
<i>viridis</i> .	Denizen.	Garden variety.
<i>Melissa officinalis</i> .	Alien.	Introduced.
<i>Teucrium Chamædrys</i> .	Alien.	Introduced.
<i>Botrys</i> .	Native ?	Probably introduced.
<i>Ajuga Chamæpitys</i> .	Nat. (Col.)	Introduced.
<i>Leonurus Cardiaca</i> .	Den. (Aln.)	Perhaps introduced.
<i>Lamium maculatum</i> .	Alien.	Naturalised.



	Cybele.	Geographie.
<i>Galeopsis Ladanum.</i>	Nat. (Col.)	
<i>ochroleuca.</i>	Colonist.	
<i>Stachys germanica.</i>	Native ?	Probably native.
<i>arvensis.</i>	Nat. (Col.)	
<i>Marrubium vulgare.</i>	Native ?	
<i>Lithospermum arvense.</i>	Nat. (Col.)	Introduced.
<i>Symphytum asperrimum.</i>	Alien.	Introduced.
<i>Borago officinalis.</i>	Alien.	Introduced.
<i>Lycopsis arvensis.</i>	Nat. (Col.)	Introduced.
<i>Anchusa officinalis.</i>	Alien.	Naturalised.
<i>sempervirens.</i>	Denizen.	Naturalised.
<i>Asperuga procumbens.</i>	Denizen.	Naturalised.
<i>Echinosperrum Lappula.</i>	Alien.	Naturalised.
<i>deflexum.</i>	Alien.	Introduced.
<i>Cynoglossum Omphalodes.</i>	Alien.	
<i>Pulmonaria officinalis.</i>	Alien.	Perhaps introduced.
<i>Cyclamen hederifolium.</i>	Den. (Aln.)	Naturalised.
<i>Lysimachia ciliata.</i>	Alien.	Naturalised.
<i>punctata.</i>	Alien.	
<i>Anagallis arvensis.</i>	Native (?)	Undecided.
<i>cærulea.</i>	Colonist.	Undecided.
<i>Amaranthus Blitum.</i>	Alien.	Introduced.
<i>Chenopodium Henricus.</i>	Native ?	Probably native.
<i>polyspermum.</i>	Nat. (Col.)	
<i>Chenopodia (varia).</i>	Natives (?)	From the East.
<i>Atriplex hortensis.</i>	Alien.	From the East.
<i>nitens.</i>	Alien.	From the East.
<i>Polygonum Convolvulus.</i>	Native (?)	From West Asia.
<i>dumetorum.</i>	Native (?)	Probably native.
<i>Fagopyrum.</i>	Alien.	Introduced.
<i>Rumex alpinus.</i>	Alien.	Naturalised.
<i>pulcher.</i>	Native (?)	Naturalised.
<i>scutatus.</i>	Alien.	Naturalised.
<i>Daphne Mezereum.</i>	Denizen.	Probably native.
<i>Asarum europæum.</i>	Denizen.	Probably native.
<i>Aristolochia Clematitis.</i>	Alien.	Naturalised.
<i>Euphorbia Helioscopia.</i>	Nat. (Col.)	Introduced.
<i>platyphyllos.</i>	Colonist.	Introduced.
<i>coralloides.</i>	Alien.	

	Cybele.	Geographie.
<i>Euphorbia Esula.</i>	Nat. (Aln.)	Naturalised ?
<i>Cyparissias.</i>	Alien.	Naturalised.
<i>exigua.</i>	Nat. (Col.)	Introduced.
<i>Peplus.</i>	Nat. (Col.)	
<i>Lathyrus.</i>	Alien.	Naturalised.
<i>dulcis, &amp;c.</i>	Aliens.	Introduced.
<i>Buxus sempervirens.</i>	Denizen.	Undecided.
<i>Mercurialis annua.</i>	Native (?)	Naturalised.
<i>Urtica pilulifera.</i>	Alien.	Naturalised.
<i>Humulus Lupulus.</i>	Denizen.	Native.
<i>Castanea vulgaris.</i>	Alien.	Undecided.
<i>Populus nigra.</i>	Nat. (Aln.)	
<i>Salix cuspidata.</i>	Alien.	
<i>undulata.</i>	Native ?	
<i>acuminata.</i>	Native (?)	
<i>Crocus vernus, &amp;c.</i>	Aliens.	Naturalised.
<i>nudiflorus.</i>	Aln. (Den.)	
<i>Iris tuberosa.</i>	Alien.	Naturalised.
<i>xiphioides.</i>	Alien.	Naturalised.
<i>Narcissus poeticus.</i>	Alien.	Naturalised.
<i>biflorus.</i>	Alien.	Naturalised.
<i>incomparabilis.</i>	Alien.	Naturalised.
<i>minor, &amp;c.</i>	Aliens.	
<i>Galanthus nivalis.</i>	Alien ?	Probably native.
<i>Leucojum æstivum.</i>	Denizen.	Introduced ?
<i>Lilium pyrenaicum.</i>	Alien.	Introduced.
<i>Martagon.</i>	Alien.	Naturalised.
<i>Tulipa sylvestris.</i>	Alien ?	Naturalised.
<i>Fritillaria Meleagris.</i>	Native ?	Perhaps native.
<i>Allium ampeloprasum.</i>	Alien.	Naturalised.
<i>Babingtonii.</i>	Alien.	
<i>ambiguum.</i>	Alien.	Naturalised.
<i>Ornithogalum umbellatum.</i>	Alien.	Introduced.
<i>nutans.</i>	Alien.	Naturalised.
<i>Muscari racemosum.</i>	Aln. (Den.)	Perhaps native.
<i>Simethis bicolor.</i>	Native ?	
<i>Convallaria bifolia.</i>	Alien.	Native.
<i>Stratiotes aloides.</i>	Nat. (Den.)	From Asia.
<i>Anacharis Alsinastrum.</i>	Den. (Aln.)	Naturalised.

	Cybele.	Geographie.
<i>Luzula nivea</i> .	Alien.	Introduced.
<i>Spartina alterniflora</i> .	Aln. (Den.)	Undecided.
<i>Digitaria sanguinalis</i> .	Alien.	Introduced ?
<i>humifusa</i> .	Denizen.	Undecided.
<i>Panicum Crus-galli</i> .	Alien.	Introduced.
<i>Setaria viridis</i> .	Denizen.	Undecided.
<i>verticillata</i> .	Alien.	Introduced.
<i>glauca</i> .	Alien.	Introduced.
<i>Phalaris canariensis</i> .	Alien.	Introduced.
<i>paradoxa</i> .	Alien.	
<i>Alopecurus agrestis</i> .	Colonist ?	
<i>Apera Spica-venti</i> .	Colonist.	
<i>interrupta</i> .	Colonist.	
<i>Avena fatua</i> .	Colonist.	
<i>strigosa</i> .	Alien.	Introduced.
<i>Briza minor</i> .	Nat. (Col.)	Introduced.
<i>Cynosurus echinatus</i> .	Alien.	
<i>Bromus secalinus</i> .	Colonist.	
<i>arvensis</i> , &c.	Aliens.	
<i>Lolium temulentum</i> .	Colonist.	Introduced ?
<i>linicola</i> .	Alien.	
<i>italicum</i> .	Alien.	
<i>Cistopteris alpina</i> .	Alien ?	
<i>Onoclea sensibilis</i> .	Alien.	

According to the *Cybele Britannica*, as above :—

Aliens, 180. Colonists, 54. Denizens, 60.

Natives, more or less questionably so, 30.

According to the *Geographie Botanique* :—

Naturalised, 83. Not noticed, &c., 92.

Introduced, or probably introduced, 100.

Native, possibly or probably so, 47.

After making the requisite allowance for the different objects sought, and the difference of terms used in the two works, the accordance between the *Cybele* and the *Geographie* is satisfactorily close. The discordances are



mostly explained by the different views on the comparative value of the evidences or data, as set forth in the two works. The instances are few, where aliens or colonists of the Cybele are held natives by the *Geographie*; or where the natives of the Cybele are reduced to lower position in the *Geographie*; although instances of each kind do occur.

It is likely that English botanists, while looking over the list, will feel some surprise at the opinions of M. De Candolle in relation to the nativity or naturalisation of several of the species. They will be reluctant to admit his idea, that *Anemone ranunculoides* and *Stachys germanica* are more likely native here, than are *Fedia olitoria* and *Fumaria officinalis*. They will scarcely concur with him in holding that *Papaver dubium* and *Raphanus Raphanistrum* are less entitled to be held naturalised species, than are *Oenothera biennis* and *Tragopogon porrifolius*; all four being alike excluded from the native category. A second list of the distrusted species, presently to be given, will enable readers to compare the current opinions of various English botanists with those evinced in the Cybele and the *Geographie*. That the Author of the former dissents from the conclusions arrived at by the Author of the *Geographie*, in several instances, is sufficiently apparent from the preceding list. For example, he cannot admit that *Thlaspi arvense* and *Barbarea præcox* present more appearance or probability of being native, than do *Rumex pulcher* and *Linaria Elatine*; though it is quite possible that these two latter are properly deemed introduced plants; the former of these two having a very interrupted or scattered distribution by road-sides, and the latter being chiefly limited to worked ground. On the contrary, it is admitted that M. De Candolle may have been more correct in removing

the *Coronopus didyma* and *Stratiotes aloides* from the native category, in which they had been placed in the earlier volumes of this work, in accordance with the usual ideas of English botanists about them.

#### 4. *Views of English Botanists.*

The views of English botanists, in regard to the nativity of the species which now compose the flora of Britain, are for the most part very imperfect and empirical; being guesses emanating from observations made too locally, and too little corrected by comprehensive views in science. Still, the collective opinions of good observers in British botany ought to possess some value, and ought to be allowed their full weight in balancing the probabilities of certain species being aboriginal natives or otherwise. Accordingly, it has been deemed worth while to repeat the list of introduced and distrusted plants, in order to give a condensed summary of the views of various English botanists, both general and local. The names of plants in the second list, subjoined, are repetitions of those in the former list. They are followed by three treble columns of abbreviations; each column being subdivisible into three series.

The *First* of the three columns compares the opinions entertained by the Author of this work, — by Mr. C. C. Babington, as set forth in the fourth edition of the *Manual of British Botany*, — and by Professor Henslow, as indicated in his *Catalogue of British Plants*, published in 1835. The two latter Authors distinguish the plants into four classes or divisions; namely, native—possibly introduced—certainly introduced—disregarded or discarded from the flora of Britain. The usual terms applied to designate the predial (civil or national) claims of

the species in the present work, having been given in the former list, four other terms are here substituted, for more ready comparison with the definitions and terms used by Henslow and Babington; from which they still differ, however, in one respect, that of placing two degrees (possibly and probably introduced) between the native and certainly introduced species. The incognits or discarded species of the Cybele are left out of the lists. The abbreviations are intelligible enough, being simply the three first letters in the series of terms. It is to be kept in recollection that the indications in this first column are *general*; relating to the whole of Britain.

The *Second* column, where numerals are employed, is founded upon twenty-eight local lists of plants, for small tracts of country, spotted about various parts of Britain, from the southern coasts of England, northwards to Nairn and Elgin in Scotland. All these lists are marked so as to distinguish the *local* conditions of the species into three categories or classes; namely, native — dubiously native — introduced. The number of such lists, among the whole twenty-eight, in which the species are so noted, is shown in the column of numerals. It will be seen by the cipher that many of the distrusted natives are absent from all the twenty-eight local tracts; while others are found in only few of them; circumstances which do not tend to lessen the distrust of their true nativity. The history of these twenty-eight lists is shortly thus. In order to obtain a greater amount of information about local botany, than could be acquired from the published Floras and other data alone, printed lists of British plants were sent to many of the provincial botanists, with a request that they would mark the names of species known to them as occurring within a defined space. Most usually the area selected was that com-



prised within a circle of three or more miles distance, traced around their own towns or abodes ; larger spaces being sometimes taken instead, according to individual preference or convenience. From the catalogues thus kindly supplied, have been selected the twenty-eight used in the subjoined list. Contrary to the first column, it must be recollected, the second one sums up into numerical figures the *local* conditions of the species.

The *Third* column also exhibits the local conditions of the plants, doing this singly and individually for three tracts. The Collectanea for a Flora of Moray has been before alluded to, as the first publication on local botany in which advanced views were shown in regard to the native or accidental occurrence of the species in the tract of country to which it relates. Only three divisions were made in that work, namely, 'native—dubious—introduced.' But the application of the two latter of these three terms is made with much freedom and clearness of view. Moray is nearly equivalent to the sub-province of North-east Highlands.—More recently, in the Supplement to the Flora of Yorkshire, Mr. J. G. Baker has adopted the terms used in the Cybele Britannica, and applied them (with the necessary variations in use) to express the local conditions of the species in that county and province. So that we can thus find two spaces in the north and middle of Britain, the floras of which can be compared together, with reference to questions about the nativity of the species.—Henslow's Catalogue of British Plants will again assist our inquiries here ; being made to serve also (by marks post-fixed to the names) as a list for the county of Cambridge ; and thus affording a third space for comparison with the other two, more southward on the same side of Britain. In attaching the marks to the names of species, as components of the

Cambridge flora, Professor Henslow was on his own ground, and less dependent on the often-misleading records of other botanists. Thus, in the third column of the subjoined List, we have the individual views of the Reverend George Gordon (jointly with Mr. W. A. Stables), of Mr. J. G. Baker, and of Professor J. S. Henslow;—each for his own district, Moray, Yorkshire, Cambridge-shire.

	Wats.	Bab.	Hens.	Nat.	Dub.	Int.	Cam.	York.	Mor.
<i>Anemone apennina</i> .	cer.	cer.	cer.	0	0	0	...	aln.	...
<i>ranunculoides</i> .	pro.	cer.	nat.	0	0	0	...	...	...
<i>Adonis autumnalis</i> .	pro.	pos.	cer.	2	2	3	...	aln.	...
<i>Ranunculus arvensis</i> .	pro.	pos.	pos.	17	0	0	pos.	col.	...
<i>Eranthis hyemalis</i> .	cer.	cer.	dis.	0	0	2	...	...	...
<i>Helleborus viridis</i> .	pos.	nat.	nat.	7	3	2	pos.	nat.	...
<i>scetidus</i> .	pos.	nat.	nat.	5	0	0	pos.	den.	...
<i>Delphinium Ajacis</i> ?	pro.	pos.	pos.	0	0	3	pos.	aln.	...
<i>Aconitum Napellus</i> .	pro.	pos.	cer.	0	1	3	...	aln.	...
<i>Pæonia corallina</i> .	cer.	cer.	pos.	0	0	0	...	...	cer.
<i>Berberis vulgaris</i> .	pos.	nat.	nat.	7	5	5	nat.	den.	...
<i>Epimedium alpinum</i> .	cer.	dis.	dis.	0	0	1	...	aln.	...
<i>Papaver hybridum</i> .	pro.	nat.	pos.	5	0	0	pos.	col.	...
<i>Argemone</i> .	pro.	nat.	pos.	21	0	0	pos.	col.	nat.
<i>dubium</i> .	pro.	nat.	pos.	20	0	0	pos.	col.	nat.
<i>Rhœas</i> .	pro.	nat.	pos.	21	0	0	pos.	col.	...
<i>somniferum</i> .	cer.	pos.	cer.	0	1	5	cer.	aln.	cer.
<i>Chelidonium majus</i> .	pro.	nat.	pos.	19	6	1	pos.	den.	dub.
<i>Glaucium violaceum</i> .	pro.	pos.	pos.	0	0	0	...	...	...
<i>Corydalis lutea</i> .	cer.	cer.	cer.	0	4	5	exc.	aln.	cer.
<i>solida</i> .	cer.	cer.	cer.	0	0	0	...	aln.	...
<i>Fumaria capreolata</i> .	pos.	nat.	pos.	21	1	0	pos.	nat.?	dub.
<i>officinalis</i> .	pos.	nat.	pos.	27	0	0	pos.	nat.?	nat.
<i>micrantha</i> .	pro.	nat.	pos.	1	0	0	...	...	nat.
<i>parviflora</i> .	pro.	nat.	pos.	1	0	0	pos.	inc.	nat.
<i>Vaillantii</i> .	pro.	nat.	pos.	0	0	0	...	...	...
<i>Crambe orientalis</i> .	cer.	dis.	dis.	0	0	1	...	...	cer.
<i>Coronopus didyma</i> .	pro.	nat.	nat.	4	0	1	...	aln.	...
<i>Isatis tinctoria</i> .	pro.	pos.	cer.	0	0	0	exc.	...	...

	Wats.	Bab.	Hens.	Nat.	Dub.	Int.	Cam.	York.	Mor.
<i>Thlaspi arvense</i> .	pos.	nat.	pos.	13	0	1	cer.	col.	nat.
<i>Iberis amara</i> .	pro.	nat.	cer.	0	0	0	...	aln.	...
<i>Lepidium Draba</i> .	cer.	cer.	cer.	0	0	1	...	aln.	...
<i>ruderales</i> .	pro.	nat.	nat.	1	1	2	pos.	aln.	...
<i>sativum</i> .	cer.	dis.	dis.	0	0	0	...	aln.	...
<i>Armoracia rusticana</i> .	cer.	nat.	cer.	0	4	8	cer.	aln.	...
<i>Camelina sativa</i> , &c.	cer.	dis.	cer.	0	2	5	cer.	aln.	cer.
<i>Koniga maritima</i> .	cer.	cer.	dis.	0	0	2	...	...	...
<i>Alyssum calycinum</i> .	pro.	nat.	...	0	1	0	...	aln.	...
<i>Arabis Turrita</i> .	cer.	cer.	pos.	0	0	0	cer.	...	...
<i>Barbarea præcox</i> .	pro.	nat.	cer.	1	1	1	...	alu.	...
<i>Sisymbrium Irio</i> .	pos.	nat.	nat.	1	0	0	...	...	...
<i>polyceratiu</i> .	cer.	cer.	dis.	0	0	0	...	...	...
<i>Erysimum cheiranthoid</i> .	pos.	nat.	nat.	4	1	0	pos.	aln.	dub.
<i>virgatum</i> .	cer.	dis.	dis.	0	0	0	...	...	...
<i>orientale</i> .	cer.	cer.	pos.	0	0	0	...	...	...
<i>Cheiranthus Cheiri</i> .	pro.	pos.	cer.	3	2	11	cer.	aln.	dub.
<i>Mathiola incana</i> .	pos.	nat.	dis.	1	0	0	...	...	...
<i>Malcolmia maritima</i> .	cer.	dis.	dis.	0	0	0	...	...	...
<i>Hesperis matronalis</i> .	pro.	pos.	cer.	0	7	4	...	aln.	cer.
<i>Brassica oleracea</i> .	pos.	nat.	nat.	4	0	1	...	den.	...
<i>campestris</i> .	pos.	nat.	nat.	7	0	1	...	col.	...
<i>Rapa</i> .	cer.	var.	cer.	5	1	10	cer.	col.	cer.
<i>Napus</i> .	pro.	nat.	cer.	11	3	4	cer.	col.	cer.
<i>Sinapis alba</i> .	pro.	nat.	nat.	12	3	0	nat.	col.	...
<i>tenuifolia</i> .	pos.	nat.	pos.	3	1	0	...	den.	...
<i>muralis</i> .	pos.	nat.	cer.	3	1	0	...	...	...
<i>Raphanus Raphanistrum</i> .	pro.	nat.	pos.	18	0	0	pos.	col.	dub.
<i>Reseda fruticulosa</i> .	cer.	pos.	dis.	1	0	2	...	...	...
<i>Phyteuma</i> .	cer.	dis.	dis.	0	0	0	...	...	...
<i>Viola odorata</i> .	pos.	nat.	nat.	16	1	0	nat.	den.	...
<i>Dianthus Armeria</i> .	pos.	nat.	nat.	5	0	0	...	nat.	...
<i>plumarius</i> .	cer.	pos.	dis.	1	0	0	...	aln.	...
<i>Caryophyllus</i> .	cer.	pos.	cer.	0	0	0	exc.	inc.	...
<i>Saponaria officinalis</i> .	pro.	nat.	pos.	6	2	5	cer.	den.	cer.
<i>vaccaria</i> .	cer.	dis.	dis.	0	0	0	...	aln.	...
<i>Cucubulus baccifer</i> .	cer.	dis.	dis.	0	0	0	...	...	...
<i>Silene italica</i> .	pos.	dis.	pos.	0	0	0	...	...	...
<i>noctiflora</i> .	pro.	nat.	nat.	1	2	0	nat.	col.	...



	Wats.	Bab.	Hens.	Nat.	Dub.	Int.	Cam.	York.	Mor.
<i>Lychnis Githago.</i>	pro.	nat.	pos.	21	5	2	pos.	col.	...
<i>Linum usitatissimum.</i>	cer.	cer.	dis.	1	1	13	exc.	aln.	...
<i>Malva verticillata.</i>	cer.	dis.	dis.	0	0	0	...	...	...
<i>Althæa hirsuta.</i>	pro.	pos.	cer.	1	0	0	...	...	...
<i>Tilia parvifolia.</i>	pos.	nat.	nat.	2	1	2	exc.	aln.	...
<i>europæa.</i>	pro.	cer.	dis.	1	4	12	exc.	aln.	cer.
<i>grandifolia.</i>	pro.	cer.	dis.	1	1	5	...	aln.	cer.
<i>Hypericum calycinum.</i>	cer.	cer.	dis.	0	0	3	...	aln.	...
<i>Acer Pseudoplatanus.</i>	pro.	pos.	cer.	2	8	10	cer.	aln.	...
<i>Erodium moschatum.</i>	nat.	nat.	nat.	4	1	0	...	den.	...
<i>Geranium striatum.</i>	cer.	dis.	dis.	1	0	0	...	aln.	...
<i>phœum.</i>	pro.	nat.	nat.	2	1	1	exc.	aln.	...
<i>pyrenaicum.</i>	pos.	nat.	nat.	6	0	2	cer.	den.	dub.
<i>Impatiens Noli.</i>	pos.	nat.	nat.	0	0	3	...	aln.	...
<i>fulva.</i>	cer.	cer.	cer.	0	0	0	...	...	...
<i>Oxalis corniculata.</i>	pro.	nat.	cer.	1	1	2	...	...	...
<i>stricta.</i>	pro.	dis.	dis.	1	0	1	...	...	...
<i>Staphylea pinnata.</i>	cer.	dis.	dis.	0	0	0	...	aln.	...
<i>Ononis reclinata.</i>	pro.	nat.	...	0	0	0	...	...	...
<i>Medicago sativa.</i>	cer.	cer.	cer.	1	1	10	cer.	aln.	...
<i>sylvestris.</i>	pro.	nat.	dis.	0	0	0	...	...	...
<i>falcata.</i>	pro.	nat.	cer.	1	0	0	cer.	inc.	...
<i>denticulata.</i>	pos.	nat.	nat.	3	0	0	...	nat.	...
<i>Melilotus officinalis.</i>	pos.	nat.	nat.	16	2	1	nat.	den.	...
<i>arvensis.</i>	pro.	nat.	...	0	0	0	...	...	...
<i>vulgaris.</i>	pro.	nat.	nat.	2	3	3	...	aln.	...
<i>Trifolium elegans.</i>	cer.	dis.	dis.	0	0	0	...	...	...
<i>resupinatum.</i>	cer.	dis.	pos.	0	0	0	...	...	...
<i>stellatum.</i>	pro.	pos.	pos.	0	0	0	...	...	...
<i>tomentosum.</i>	cer.	dis.	dis.	0	0	0	...	...	...
<i>Scorpiurus subvillosus.</i>	cer.	dis.	dis.	0	0	0	...	...	...
<i>Lathyrus Aphaca.</i>	pro.	nat.	nat.	3	0	0	...	inc.	...
<i>hirsutus.</i>	pos.	nat.	nat.	0	0	0	...	...	...
<i>latifolius.</i>	cer.	dis.	pos.	0	0	0	pos.	aln.	...
<i>Prunus avium.</i>	pos.	nat.	nat.	14	1	1	cer.	den.	cer.
<i>Spiræa salicifolia.</i>	pro.	pos.	pos.	0	2	5	...	aln.	cer.
<i>Fragaria elatior.</i>	pro.	pos.	nat.	1	1	0	...	inc.	...
<i>Rosa cinnamomea.</i>	cer.	dis.	dis.	0	0	0	...	inc.	...
<i>lucida.</i>	cer.	dis.	dis.	0	0	0	...	...	...

	Wats.	Bab.	Hens.	Nat.	Dub.	Int.	Cam.	York.	Mor.
<i>Mespilus germanica</i> .	pro.	nat.	cer.	1	2	0	...	aln.	...
<i>Pyrus communis</i> .	pro.	nat.	nat.	6	1	0	exc.	den.	...
<i>domestica</i> .	cer.	dis.	nat.	0	0	0	...	...	...
<i>Oenothera biennis</i> .	cer.	cer.	cer.	0	0	8	...	aln.	...
<i>Tamarix anglica</i> .	cer.	pos.	pos.	0	0	0	...	...	...
<i>Claytonia perfoliata</i> .	cer.	dis.	dis.	0	0	0	...	...	...
<i>Ribes nigrum</i> .	pro.	nat.	nat.	3	5	2	cer.	den.	...
<i>Grossularia</i> .	pro.	pos.	cer.	8	8	9	cer.	den.	cer.
<i>Sedum dasyphyllum</i> .	pro.	nat.	nat.	1	0	1	cer.	aln.	...
<i>album</i> .	pro.	nat.	nat.	2	6	1	cer.	aln.	...
<i>sexangulare</i> .	pro.	dis.	nat.	0	0	0	...	aln.	...
<i>reflexum</i> .	pro.	nat.	nat.	13	1	3	cer.	aln.	dub.
<i>Sempervivum tectorum</i> .	cer.	dis.	dis.	3	3	19	exc.	aln.	...
<i>Saxifraga Geum</i> .	cer.	dis.	...	0	0	0	...	aln.	...
<i>umbrosa</i> .	pro.	pos.	...	1	2	0	...	nat.	...
<i>Eryngium campestre</i> .	pos.	nat.	nat.	0	0	1	...	inc.	...
<i>Astrantia major</i> .	pro.	pos.	...	0	0	0	...	...	...
<i>Smyrniun Olusatrum</i> .	pos.	nat.	nat.	6	2	0	cer.	den.	...
<i>Petroselinum sativum</i> .	cer.	pos.	cer.	3	0	9	...	alu.	...
<i>Ægopodium Podagraria</i> .	pos.	nat.	nat.	20	4	0	nat.	nat.	dub.
<i>Carum Carui</i> .	pro.	pos.	cer.	0	3	4	cer.	aln.?	cer.
<i>Bupleurum falcatum</i> .	pro.	nat.	pos.	0	0	0	...	...	...
<i>rotundifolium</i> .	pro.	nat.	pos.	3	1	0	pos.	col.	...
<i>Fœniculum vulgare</i> .	pos.	nat.	nat.	7	1	2	pos.	aln.	...
<i>Peucedanum Ostruthium</i> .	pro.	pos.	nat.	0	1	2	...	den.	cer.
<i>Tordylium maximum</i> .	pos.	nat.	cer.	0	0	0	...	...	...
<i>Caucalis daucoides</i> .	pro.	nat.	pos.	1	1	0	cer.	col.	...
<i>Turgenia latifolia</i> .	cer.	pos.	cer.	0	0	0	cer.	...	...
<i>Torilis infesta</i> .	pro.	nat.	nat.	10	0	0	nat.	nat.	...
<i>Scandix Pecten</i> .	pro.	nat.	nat.	19	1	0	nat.	col.	dub.
<i>Anthriscus Cerefolium</i> .	cer.	pos.	nat.	2	0	0	...	aln.	...
<i>Myrrhis odorata</i> .	pos.	nat.	nat.	8	0	2	...	nat.	cer.
<i>Coriandrum sativum</i> .	cer.	cer.	cer.	0	0	1	exc.	...	...
<i>Sambucus Ebulus</i> .	pos.	nat.	nat.	9	0	1	nat.	den.	dub.
<i>Lonicera Caprifolium</i> .	pro.	pos.	pos.	1	0	2	pos.	aln.	...
<i>Xylosteum</i> .	pro.	nat.	pos.	1	1	3	...	alu.	...
<i>Galium tricornis</i> .	pro.	nat.	pos.	0	0	0	pos.	col.	...
<i>Vaillantii</i> .	pro.	nat.	pos.	0	0	0	...	...	...
<i>Asperula taurina</i> .	cer.	cer.	dis.	0	0	0	...	...	...

	Wats.	Bab.	Hens.	Nat.	Dub.	Int.	Cam.	York.	Mor.
<i>Asperula arvensis.</i>	cer.	dis.	dis.	0	0	0	...	aln.	...
<i>Centranthus ruber.</i>	cer.	pos.	cer.	0	1	7	exc.	aln.	...
<i>Calcitrapa.</i>	cer.	dis.	dis.	0	0	0	...	...	...
<i>Valeriana pyrenaica.</i>	cer.	cer.	cer.	0	1	0	...	...	...
<i>Fedia olitoria.</i>	pos.	nat.	pos.	23	0	0	pos.	nat.	nat.
<i>carinata.</i>	pro.	nat.	pos.	1	0	0	...	den.	dub.
<i>Auricula.</i>	pro.	nat.	pos.	1	0	0	...	col.	...
<i>dentata.</i>	pro.	nat.	pos.	16	1	0	cer.	col.	...
<i>Tragopogon porrifolius.</i>	pro.	pos.	pos.	0	1	1	...	den.	...
<i>Lactuca Scariola.</i>	pos.	nat.	nat.	0	0	0	nat.	...	...
<i>Hieracium aurantiacum.</i>	cer.	cer.	pos.	0	1	1	...	aln.	cer.
<i>amplexicaule.</i>	cer.	dis.	pos.	0	0	0	...	...	...
<i>Barkhausia setosa.</i>	cer.	dis.	dis.	0	0	2	...	...	...
<i>Carduus Marianus.</i>	pro.	nat.	nat.	9	5	2	nat.	den.	cer.
<i>Onopordum Acanthium.</i>	pos.	nat.	nat.	7	1	1	nat.	nat.?	...
<i>Centaurea montana.</i>	cer.	dis.	dis.	0	0	0	...	aln.	...
<i>Cyanus.</i>	pro.	nat.	pos.	15	3	1	pos.	col.	nat.
<i>solstitialis.</i>	cer.	cer.	cer.	0	0	1	exc.	aln.	...
<i>Antennaria margaritac.</i>	cer.	pos.	pos.	0	1	1	...	aln.	...
<i>Gnaphalium luteo-album.</i>	cer.	nat.	dis.	0	0	0	exc.	...	...
<i>Filago gallica.</i>	pro.	nat.	dis.	0	0	0	...	...	...
<i>Petasites albus.</i>	cer.	dis.	dis.	0	0	0	...	aln.	...
<i>fragrans.</i>	cer.	dis.	dis.	0	0	0	...	...	...
<i>Erigeron canadensis.</i>	cer.	cer.	cer.	0	0	0	...	...	...
<i>Senecio squalidus.</i>	cer.	cer.	cer.	0	0	0	...	...	...
<i>saracenicus?</i>	pro.	nat.	nat.	0	0	1	...	den.	cer.
<i>Doronicum Pardalianch.</i>	pro.	pos.	pos.	1	0	3	...	aln.	cer.
<i>plantagineu.</i>	pro.	pos.	pos.	0	0	1	...	aln.	...
<i>Chrysanthemum segetum.</i>	pro.	nat.	pos.	18	0	0	pos.	col.	nat.
<i>Pyrethrum Parthenium.</i>	pro.	nat.	nat.	12	11	1	nat.	den.	dub.
<i>Anthemis tinctoria.</i>	cer.	dis.	nat.	0	0	0	...	...	...
<i>arvensis.</i>	pro.	nat.	nat.	16	1	0	nat.	nat.	dub.
<i>Cotula.</i>	pos.	nat.	nat.	15	0	0	nat.	nat.	...
<i>Achillea tomentosa.</i>	cer.	cer.	nat.	0	0	1	...	aln.	...
<i>tanacetifolia.</i>	pro.	nat.	...	0	0	0	...	inc.	...
<i>Xanthium Strumarium.</i>	pro.	dis.	dis.	0	0	0	...	...	...
<i>Campanula Rapunculus.</i>	pos.	nat.	nat.	0	0	1	...	den.	...
<i>persicifolia.</i>	cer.	cer.	dis.	0	0	0	...	aln.	...
<i>Specularia hybrida.</i>	pro.	nat.	nat.	8	0	0	nat.	col.	...



	Wats.	Bab.	Hens.	Nat.	Dub.	Int.	Cam.	York.	Mor.
<i>Vinca minor.</i>	pos.	nat.	nat.	4	4	9	cer.	aln.?	cer.
<i>major.</i>	cer.	cer.	cer.	0	3	9	cer.	aln.	...
<i>Cuscuta Epilinum.</i>	cer.	pos.	...	0	0	2	...	...	...
<i>Trifolii.</i>	pro.	pos.	...	2	2	1	...	col.?	...
<i>corymbosa.</i>	cer.	dis.	...	0	0	1	...	...	...
<i>Atropa Belladonna.</i>	pos.	nat.	nat.	4	0	2	nat.	den.	cer.
<i>Datura Stramonium.</i>	cer.	pos.	dis.	0	0	1	exc.	aln.	cer.
<i>Physalis Alkekenji.</i>	cer.	dis.	dis.	0	0	0	...	...	...
<i>Lycium barbarum.</i>	cer.	dis.	dis.	0	0	0	...	aln.	...
<i>Verbascum Blattaria.</i>	pro.	nat.	nat.	2	0	1	...	den.?	...
<i>virgatum.</i>	pro.	nat.	nat.	0	1	0	...	...	...
<i>phœniceum.</i>	cer.	dis.	dis.	0	0	0	...	...	...
<i>Veronica Buxbaumii.</i>	pro.	cer.	cer.	5	0	5	cer.	aln.	cer.
<i>Melampyrum arvense.</i>	pro.	nat.	nat.	1	0	0	...	...	...
<i>Scrophularia vernalis.</i>	pro.	nat.	nat.	1	0	0	...	den.	...
<i>Antirrhinum majus.</i>	cer.	cer.	cer.	1	3	8	cer.	aln.	...
<i>Orontium.</i>	pro.	nat.	pos.	9	0	0	...	nat.?	...
<i>Linaria Cymbalaria.</i>	cer.	cer.	cer.	2	2	14	cer.	aln.	cer.
<i>spuria.</i>	pro.	nat.	nat.	9	0	0	nat.	nat.	...
<i>Elatine.</i>	pos.	nat.	nat.	11	0	0	nat.	nat.	...
<i>purpurea.</i>	cer.	dis.	dis.	0	0	0	...	...	...
<i>supina.</i>	cer.	cer.	dis.	0	0	0	...	...	...
<i>minor.</i>	pro.	nat.	nat.	8	0	0	nat.	nat.	...
<i>Mimulus luteus.</i>	cer.	dis.	dis.	0	0	4	...	aln.	...
<i>Orobanche ramosa.</i>	cer.	dis.	nat.	0	0	0	nat.	...	...
<i>Acanthus mollis.</i>	cer.	dis.	dis.	0	0	0	...	...	...
<i>Salvia pratensis.</i>	pro.	nat.	nat.	0	0	1	...	inc.	...
<i>Mentha sylvestris.</i>	pos.	nat.	nat.	4	0	0	nat.	nat.	dub.
<i>viridis.</i>	var.	nat.	pos.	5	1	5	nat.	den.	cer.
<i>Melissa officinalis.</i>	cer.	cer.	dis.	0	0	1	...	...	...
<i>Teucrium Chamædrys.</i>	cer.	nat.	cer.	1	0	1	...	inc.	...
<i>Botrys.</i>	pro.	nat.	...	0	0	0	...	...	...
<i>Ajuga Chamæpitys.</i>	pro.	nat.	nat.	1	0	0	nat.	...	...
<i>Leonurus Cardiaca.</i>	pro.	pos.	nat.	1	2	0	exc.	den.	dub.
<i>Lamium maculatum.</i>	cer.	pos.	var.	0	0	0	...	aln.	...
<i>Galeopsis Ladanum.</i>	pro.	nat.	nat.	10	2	0	nat.	nat.	nat.
<i>ochroleuca.</i>	pro.	nat.	nat.	0	0	0	...	col.	...
<i>Stachys germanica.</i>	pro.	nat.	nat.	0	0	0	...	aln.	...
<i>arvensis.</i>	pro.	nat.	nat.	14	0	0	nat.	nat.	nat.

	Wats.	Bab.	Hens.	Nat.	Dub.	Int.	Cam.	York.	Mor.
<i>Marrubium vulgare</i> .	pos.	nat.	nat.	9	2	1	nat.	nat.	...
<i>Lithospermum arvense</i> .	pro.	nat.	nat.	15	2	0	nat.	nat.	dub.
<i>Symphytum asperrimum</i> .	cer.	dis.	dis.	0	0	0	...	...	...
<i>Borago officinalis</i> .	cer.	pos.	cer.	6	3	8	cer.	aln.	cer.
<i>Lycopsis arvensis</i> .	pro.	nat.	nat.	22	0	0	nat.	nat.	dub.
<i>Anchusa officinalis</i> .	cer.	pos.	pos.	0	0	1	...	...	...
<i>sempervirens</i> .	pro.	pos.	pos.	5	5	3	exc.	den.	cer.
<i>Asperugo procumbens</i> .	pro.	nat.	nat.	0	0	0	exc.	...	...
<i>Echinosperrum Lappul.</i>	cer.	dis.	dis.	0	0	0	...	...	...
<i>deflexu.</i>	cer.	dis.	dis.	0	0	0	...	...	...
<i>Cynoglossum Omphalod.</i>	cer.	dis.	dis.	0	0	0	...	...	...
<i>Pulmonaria officinalis</i> .	cer.	nat.	pos.	0	0	4	...	aln.	cer.
<i>Cyclamen hederifolium</i> .	pro.	nat.	nat.	0	0	0	...	...	...
<i>Lysimachia ciliata</i> .	cer.	cer.	...	0	0	0	...	...	...
<i>punctata</i> .	cer.	dis.	dis.	0	0	0	...	...	...
<i>Anagallis arvensis</i> .	pos.	nat.	nat.	25	2	0	nat.	nat.	dub.
<i>cærulea</i> .	pro.	nat.	var.	5	0	1	nat.	col.	...
<i>Amaranthus Blitum</i> .	cer.	dis.	dis.	0	0	0	exc.	...	...
<i>Chenopodium Henricus</i> .	pro.	nat.	nat.	24	2	0	nat.	den.	dub.
<i>polysperm.</i>	pro.	nat.	nat.	10	0	0	nat.	nat.	...
<i>Chenopodia (varia)</i> .	pos.	nat.	nat.	4	0	0	nat.	nat.	...
<i>Atriplex hortensis</i> .	cer.	dis.	dis.	0	0	0	...	...	...
<i>nitens</i> .	cer.	dis.	dis.	0	0	1	...	...	...
<i>Polygonum Convolvulus</i> .	pos.	nat.	nat.	28	0	0	nat.	nat.	nat.
<i>dumetorum</i> .	pos.	nat.	...	0	0	0	...	...	...
<i>Fagopyrum</i> .	cer.	cer.	dis.	0	0	1	exc.	aln.	...
<i>Rumex alpinus</i> .	cer.	cer.	nat.	0	1	1	...	...	cer.
<i>pulcher</i> .	pos.	nat.	nat.	10	0	0	nat.	...	...
<i>scutatus</i> .	cer.	dis.	dis.	0	0	0	...	inc.	...
<i>Daphne Mezereum</i> .	pos.	nat.	nat.	4	2	0	...	den.	...
<i>Asarum europæum</i> .	pos.	nat.	nat.	0	0	0	...	nat.?	...
<i>Aristolochia Clematitis</i> .	cer.	cer.	cer.	0	0	0	exc.	aln.	...
<i>Euphorbia Helioscopea</i> .	pos.	nat.	nat.	28	0	0	nat.	nat.	nat.
<i>platyphyllos</i> .	pro.	nat.	pos.	6	0	1	pos.	col.	...
<i>coralloides</i> .	cer.	cer.	...	1	0	0	...	...	...
<i>Esula</i> .	pro.	nat.	nat.	0	0	1	...	...	...
<i>Cyparissias</i> .	cer.	dis.	nat.	0	0	0	...	aln.	...
<i>exigua</i> .	pro.	nat.	nat.	21	0	0	nat.	nat.	...
<i>Peplus</i> .	pos.	nat.	nat.	23	1	0	nat.	nat.	dub.

	Wats.	Bab.	Hens.	Nat.	Dub.	Int.	Cam.	York.	Mor.
<i>Euphorbia Lathyris.</i>	pro.	nat.	cer.	2	2	2	...	aln.	...
<i>dulcis, &amp;c.</i>	cer.	dis.	dis.	0	0	1	...	...	cer.
<i>Buxus sempervirens.</i>	pro.	nat.	pos.	0	0	2	...	aln.	...
<i>Mercurialis annua.</i>	pos.	nat.	nat.	7	0	0	nat.	aln.	...
<i>Urtica pilulifera.</i>	cer.	pos.	nat.	0	2	1	...	...	...
<i>Humulus Lupulus.</i>	pos.	nat.	nat.	14	3	6	nat.	den.	cer.
<i>Castanea vulgaris.</i>	cer.	pos.	pos.	0	0	0	...	aln.	...
<i>Populus nigra.</i>	pro.	nat.	nat.	5	3	4	nat.	den.	...
<i>Salix cuspidata.</i>	pro.	pos.	...	0	0	0	...	...	...
<i>undulata.</i>	pro.	cer.	nat.	0	0	1	...	inc.	...
<i>acuminata.</i>	pro.	nat.	...	2	0	0	...	nat.	...
<i>Crocus vernus.</i>	cer.	cer.	cer.	0	0	3	...	aln.	...
<i>nudiflorus.</i>	pos.	nat.	cer.	0	0	0	...	aln.	...
<i>Iris tuberosa.</i>	cer.	cer.	dis.	0	0	0	...	...	...
<i>xiphioides.</i>	cer.	dis.	dis.	0	0	0	...	...	...
<i>Narcissus poeticus.</i>	cer.	dis.	cer.	0	0	0	...	aln.	...
<i>biflorus.</i>	pro.	cer.	nat.	2	2	1	...	aln.	...
<i>incomparabilis.</i>	cer.	dis.	dis.	0	0	1	...	aln.	...
<i>minor, &amp;c.</i>	cer.	dis.	dis.	0	0	0	...	...	cer.
<i>Galanthus nivalis.</i>	pro.	nat.	pos.	3	6	5	...	aln.?	cer.
<i>Leucjum æstivum.</i>	pos.	pos.	nat.	1	0	0	...	...	...
<i>Lilium pyrenaicum.</i>	cer.	cer.	dis.	0	0	0	...	...	...
<i>Martagon.</i>	cer.	cer.	dis.	0	1	0	...	aln.	...
<i>Tulipa sylvestris.</i>	pro.	nat.	pos.	0	0	0	...	den.	...
<i>Fritillaria Meleagris.</i>	pos.	nat.	nat.	0	2	0	exc.	inc.	...
<i>Allium ampeloprasum.</i>	cer.	cer.	cer.	0	0	0	...	...	...
<i>Babingtonii.</i>	pro.	nat.	...	0	0	0	...	...	...
<i>ambiguum.</i>	cer.	dis.	dis.	0	0	0	...	...	...
<i>Ornithogalum umbellat.</i>	cer.	pos.	cer.	4	1	2	cer.	aln.	...
<i>nutans.</i>	cer.	cer.	cer.	0	0	0	...	aln.	...
<i>Muscari racemosum.</i>	pro.	nat.	cer.	0	0	1	cer.	...	...
<i>Simethis bicolor.</i>	pos.	nat.	...	0	0	0	...	...	...
<i>Convallaria bifolia.</i>	pro.	cer.	...	0	0	0	...	...	...
<i>Stratiotes aloides.</i>	pro.	nat.	nat.	0	0	0	nat.	nat.	...
<i>Anacharis Alsinastrum.</i>	cer.	cer.	...	0	0	1	...	aln.	...
<i>Luzula nivea.</i>	cer.	dis.	dis.	0	0	0	...	...	...
<i>Spartina alterniflora.</i>	pos.	nat.	...	0	0	0	...	...	...
<i>Digitaria sanguinalis.</i>	cer.	dis.	nat.	0	0	0	...	...	...
<i>humifusa.</i>	pos.	nat.	nat.	0	0	0	...	aln.	...



	Wats.	Bab.	Hens.	Nat.	Dub.	Int.	Cam.	York.	Mor.
<i>Panicum Crus-galli.</i>	cer.	dis.	nat.	0	0	0	...	...	...
<i>Setaria viridis.</i>	pos.	nat.	nat.	0	0	0	nat.	...	...
<i>verticillata.</i>	pro.	dis.	nat.	0	0	0	...	...	...
<i>glauc.</i>	cer.	dis.	...	0	0	0	...	...	...
<i>Phalaris canariensis.</i>	cer.	cer.	cer.	0	1	12	...	aln.	...
<i>paradoxa.</i>	cer.	dis.	dis.	0	0	0	...	...	...
<i>Alopecurus agrestis.</i>	pro.	nat.	nat.	15	0	1	nat.	col.	...
<i>Apera Spica-venti.</i>	pro.	nat.	nat.	1	0	2	nat.	col.	...
<i>interrupta.</i>	pro.	nat.	...	0	0	0	...	...	...
<i>Avena fatua.</i>	pro.	nat.	nat.	13	3	0	nat.	col.	dub.
<i>strigosa.</i>	cer.	nat.	nat.	2	0	4	...	aln.	...
<i>Briza minor.</i>	pro.	nat.	nat.	3	0	0	...	...	...
<i>Cynosurus echinatus.</i>	cer.	dis.	nat.	0	1	0	...	aln.	...
<i>Bromus secalinus.</i>	pro.	cer.?	nat.	10	1	1	nat.	col.	dub.
<i>arvensis, &amp;c.</i>	cer.	dis.	nat.	0	0	0	...	aln.	...
<i>Lolium temulentum.</i>	pro.	nat.	nat.	5	1	3	nat.	nat.	dub.
<i>linicola.</i>	cer.	dis.	...	0	0	0	...	aln.	...
<i>italicum.</i>	cer.	cer.	...	3	0	2	...	aln.	...
<i>Cistopteris alpina.</i>	cer.	dis.	nat.	0	0	0	...	...	...
<i>Onoclea sensibilis.</i>	cer.	dis.	...	0	0	0	...	inc.	...

1. Abbreviations in *First* column:—nat. native.—pos. possibly introduced—pro. probably introduced—cer. certainly introduced.

2. Numerals in *Second* column:—The number of local catalogues in which the species is marked as native—dubiously native—introduced—or omitted (0).

3. Abbreviations in *Third* column:—nat. native—dub. dubiously native—pos. possibly introduced—cer. certainly introduced—exc. to be excluded—or ... absent.

In addition to the plants included in the two lists above given, there are still some other slightly distrusted British species, which are almost invariably accounted true natives with reference to Britain generally, though questioned locally. They exhibit some faint indications of a foreign origin by being usually seen in cultivated ground, on artificial mounds and rubbish heaps, by waysides and frequented places, or in the vicinity of houses.

In attempting to account for these usual positions of the plants two alternatives are presented. They may be native to the island, and requiring a soil manured or otherwise affected by animal life; and this soil they now find chiefly near the abodes of man, since the number of wild animals has been so much diminished. Or, they may be plants which have accompanied man in his migrations, and have thus got a rooting in this island through his agency. We cannot now reject them from the British flora, although their aboriginal nativity may be slightly suspected, on account of their places of growth, or for other reasons shortly expressed after their names in the subjoined List:—

- Lepidium campestre*. Cultivated ground and banks.  
*Barbarea arcuata*. Agrestal; viatical. Elsewhere?  
     *stricta*. Local; in or near inhabited places.  
*Sisymbrium Sophia*. Near towns; on rubbish heaps, &c.  
*Sinapis arvensis*. Chiefly agrestal, like the colonists.  
     *nigra*. Much cultivated. By roads and rivers.  
*Reseda Luteola*. Often on dug ground, heaps, &c.  
*Silene anglica*. Chiefly on cultivated ground.  
*Lychnis vespertina*. Corn-fields chiefly; hedge-banks, &c.  
*Holosteum umbellatum*. On buildings; and very local.  
*Malva sylvestris*. Chiefly agrestal and viatical.  
     *rotundifolia*. Way-sides, waste corners, &c.  
*Trifolium ochroleucum*. Perhaps a colonist originally.  
*Onobrychis sativa*. Local. Frequently sown in fields.  
*Lathyrus Nissolia*. Distrusted in N. France, by Dr. Godron.  
*Poterium muricatum*. Chiefly agrestal. Also in turf?  
*Ribes alpinum*. Not found in native forests, or on rocks?  
*Æthusa Cynapium*. Cultivated ground; rubbish heaps.  
*Conium maculatum*. Rubbish heaps, &c., near houses.  
*Peucedanum officinale*. Doubted by Professor Henslow.  
*Helminthia echinoides*. Distrusted in N. France, by Dr. Godron.  
*Lactuca saligna*. Rubbish heaps; way-sides, &c.  
*Cichorium Intybus*. Agrestal; viatical.  
*Centaurea Scabiosa*. Corn-fields; disturbed ground.

- Artemisia Absinthium. Often an escape from old gardens.  
 Matricaria Chamomilla. Road-sides ; heaps ; cultivated land.  
 Phyteuma spicatum. Very local. Formerly cultivated.  
 Villarsia nymphæoides. Introduced to most of its localities.  
 Hyoscyamus niger. Often about houses, and frequented spots.  
 Solanum nigrum. Chiefly near houses ; on rubbish, &c.  
 Verbascum Lychnitis. Local. Near old houses, &c.  
     floccosum. Local. Situations read suspiciously.  
 Verbena officinalis. Near houses ; by way-sides.  
 Salvia verbenaca. By way-sides ; near old abodes.  
 Mentha piperita. Possibly an escape from gardens.  
     rubra. Always near houses and roads ?  
 Galeopsis Tetrahit. Usually among crops ; sometimes elsewhere.  
     versicolor. Almost always among crops.  
 Nepeta Cataria. In isolated places ; near houses.  
 Echium vulgare. Among crops ; by road-sides, &c.  
 Chenopodium glaucum, &c. Roads ; rubbish ; frequented places.  
 Hippophae rhamnoides. Planted in most of its localities.  
 Urtica dioica. Attends the steps of man and cattle.  
     urens. Cultivated ground ; near houses.  
 Parietaria officinalis. On buildings, not rocks ; by roads.  
 Acorus Calamus. Local. Doubted. Appears native.  
 Cyperus fuscus. Sown in one or two of its three localities ?  
 Gastridium lendigerum. Agrestal chiefly.

### 5. Views of Dr. Godron, in France.

Although not within the plan of this work, to treat about the distribution of British species through other countries, it seems allowable here to mention the views of Dr. Godron, in regard to the condition of several of the seemingly British species in France. This able botanist lately published a Memoir under the long title of "*Considérations sur les Migrations des Végétaux et spécialement sur ceux qui, Etrangers au sol de France, y ont été introduits accidentellement.*" In this Memoir Dr. Godron does not profess to give a list of all the species thus introduced. Among those which he does enumerate, are



several of the species which have been admitted more or less freely into the lists of native British plants. Dr. Godron deems them to be simply naturalisations in the North of France, derived chiefly from countries more southward or more eastward; some few from America. If introductions to the North of France from the sources mentioned, there would seem an antecedent probability also of their immigration into England chiefly or solely through human agency. Among the fifty species enumerated in the subjoined list of these plants, only seven were given affirmatively as natives of Britain, in former volumes of the *Cybele*; and it is now believed that two or more of those seven ought to have been placed in a lower category. Half-a-dozen others were there given as denizens or questionable natives. Three dozens were deemed aliens or colonists. This is a fairly close approximation between views put forth quite independently of each other, and yet mutually corroborative when brought together. In the annexed list of these plants, the group to which they were severally assigned in the present work, is indicated by an abbreviation after their names.

*Species introduced into France (Godron).*

Ranunculus arvensis, col.	Erysimum cheiranthoides, col.
Delphinium Consolida, col.	Sinapis alba, col.
Papaver hybridum, col.	nigra, nat.
Argemone, col.	Saponaria vaccaria, al.
Rhœas, col.	Silene noctiflora, col.
Fumaria micrantha, nat.	Lychnis Githago, col.
Coronopus didyma, nat.	Linum usitatissimum, al.
Isatis tinctoria, al.	Oxalis corniculata, den.
Thlaspi arvense, col.	stricta, al.
Lepidium Draba, al.	Melilotus alba, al.
sativum, al.	parviflora, al.
Camelina sativa, al.	Lathyrus Nissolia, nat.

<i>Oenothera biennis</i> , al.	<i>Datura Stramonium</i> , al.
<i>Fœniculum</i> "officinale," nat.	<i>Veronica Buxbaumii</i> , al.
<i>Turgenia latifolia</i> , col.	<i>Melampyrum arvense</i> , nat.
<i>Helminthia echinoides</i> , nat.	<i>Mimulus luteus</i> , al.
<i>Lactuca saligna</i> , nat.	<i>Leonurus Cardiaca</i> , den.
<i>Barkhausia setosa</i> , al.	<i>Nepeta Cataria</i> , nat.
<i>Carduus marianus</i> , den.	<i>Borago officinalis</i> , al.
<i>Centaurea Cyanus</i> , col.	<i>Asperugo procumbens</i> , den.
<i>solstitialis</i> , al.	<i>Euphorbia platyphyllos</i> , col.
<i>Erigeron canadensis</i> , al.	<i>Apera Spica-venti</i> , col.
<i>Chrysanthemum segetum</i> , col.	<i>Bromus secalinus</i> , col.
<i>Specularia hybrida</i> , nat.	<i>Avena strigosa</i> , al.
<i>Cuscuta Trifolii</i> , col.	<i>Lolium temulentum</i> , col.

British botanists have in general regarded fully half of the species above enumerated, in the light of original natives of Britain. Their imperfect title to be so designated, is in much closer accordance with the view taken by Dr. Godron, on their non-indigenous character in North France. If he had used the like series of terms, it is probable that Dr. Godron would have applied those of 'colonist' and 'alien' to almost all of these species in France. The English reader may here be reminded, that this concurrence is not affected by the objections before made (page 89) to the arguments of M. De Candolle. Though similar conditions on the two sides of the sea, Gallic and Britannic, may corroborate each other in some degree; yet opposite conditions cannot therefore be deemed to negative each other.

#### 6. *Statistical bearings of Introduced Species.*

Looking to the large number of species in the more civilised and agricultural countries, which are known or conjectured to have been introduced by human agency, it becomes a matter for consideration, how far they will

affect those arithmetical comparisons to which phyto-geographers commonly seem to attach much importance. It appears that the flora of Britain must now include upwards of three hundred species (320 to 330, by the lists before printed) which are known, believed, or conjectured to have been introduced into this island by the agency of mankind, either intentionally or accidentally. The foreign ingredient thus constitutes nearly one-fifth of the flora, reckoned by species, after striking out of the long list several of the least suspected and of the least established species. This admixture of disputed natives is distributed very unequally among the groups of technical botany. The *Gramina* and *Liliaceæ* are largely increased in their numbers thereby; while, of their two not distant allies, *Cyperaceæ* are scarcely changed, and *Orchidaceæ* quite unchanged, in numbers. The small orders *Fumariaceæ*, *Papaveraceæ*, *Valerianaceæ*, and *Amaryllidaceæ* are very largely increased, in proportion to their actual number of included species. And some very small orders are represented by the disputed natives only, as *Tamariscaceæ*, *Balsaminaceæ*, *Apocynaceæ*, &c.

Statistical summaries, both absolute and comparative, might thus be much varied according to the exclusion or inclusion of so large a number and proportion of disputably indigenous species. In comparing together the floras of Britain and New Zealand, for example, there would at present be much more of the artificial admixture to be allowed for in that of the former country. In comparing together sections or provinces of the same country, as England with Scotland, or Thames with Severn, the effect of their introduced species might be nearly equalised in the general result. But in other comparisons, for example, between the floras of the Agrarian and Arctic regions, the results would be considerably affected; since



all the dubiously native plants may be considered to belong to the lower region exclusively. And in some instances, as intimated above, the discrepancies would be very wide, in reckoning the proportions borne by the several orders of systematic botany, either to each other, or to the total flora of the island.

In the first general List of species, to be printed some pages forward, an intermediate course will be taken. The aliens will there be omitted, and mostly so in the other lists to follow. But the denizens and colonists will usually be retained, unless where any explanation to the contrary may be given. It is easy to conceive that some of the investigations, concerning the relations between climate and vegetation, might be assisted by resorting to the mixed flora of the island, rather than by endeavouring to select one reduced as strictly as possible to its truly native elements. Example. — ‘Given the climate of Britain, — What would be the natural vegetation of the island, all plants having free access to settle on it, if so adapted?’ Under this view, all species able to establish themselves fully, as *Mimulus luteus* and *Impatiens fulva* have done, would be advantageously reckoned as component portions of the flora. On the contrary, if it be sought to trace the migrations of species, or to investigate the past history of our insular flora, then a careful elimination therefrom of every species brought into the island by human agency, as *Avena strigosa* and *Bromus secalinus* in all probability have been brought, becomes a matter of much importance.

This subject of introduced plants has encroached too largely on the pages of the present work, and must now be left for other topics. The Author has hitherto unsuccessfully tried to induce some other botanist to write a ‘History of the British flora’; — tracing out each species

back to the earliest records of its occurrence in Britain ; and also, when possible, to its still earlier relics in peat-mosses and elsewhere. The vast changes gradually wrought in the vegetation of Britain, by the conversion of forests into wastes, and of wastes into cultivated lands, would also find appropriate place in a work of the kind suggested. Such a history might be made a very valuable contribution to botanical science,—and likely enough to geological science also. But it would require to be written by a scrupulous investigator of facts, and a conscientious recorder of them. It would require to be written under a higher impulse than that which prompts to the compiling of ‘Keys’ and ‘Manuals’ for the market,—or under a worthier ambition than that of “getting up some sort of paper, likely to make a talk among the geologists, at the next Meeting of the British Association.”

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#### IV. PHYSICAL GEOGRAPHY AND CLIMATE.

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On page 14 it was intimated that section IV would be devoted to 'General Remarks;' it being then intended to combine a very brief account of the physical geography and climate along with some general remarks on the flora and botanical geography of Britain. But in attempting to combine the general remarks on both subjects, it was found that such a course would lead more to confusion than to elucidation; and that a preliminary and separate notice of geographical and climatal peculiarities would be preferable, because less complex. The intended single section thus becomes converted into two; this present division of it being restricted to a general view of the physical geography and climate, somewhat more amplified than was at first contemplated. The second division, to be devoted to some general remarks on the botanical geography of the island, its floral peculiarities and characteristics, is more conveniently postponed to the end of the volume; where statistical figures can be rendered more true and correct, by being printed after the lists which are designed to show the distribution of species under various special aspects.

1. *Geographical position.* — Britain is a portion of Europe by its geographical position. At epochs long



past it was no doubt continuous land with the neighbouring portions of France, and possibly also with Belgium and Holland, though insulated in its present conditions. At the south-eastern angle of England, the coasts of the island and continent are still only from twenty to thirty miles apart at their nearest points. In the northerly and westerly directions from those points of approach, the coasts of Britain and Europe recede gradually from each other; the continental coasts opposed to the eastern and southern coasts of the island becoming more distant. The south-eastern portion of England is thus sub-continental in position, and consequently also in climate, comparatively with the rest of Britain; while the northern and western portions become more insular in character and climate; peculiarities which modify also the general vegetation. The position of Ireland, situate opposite to the western coasts of Britain, partially interferes with the climatal results of this increased insularity, by impeding the full influence of a western ocean on those coasts and their climate, unless at the two extremes, north and south. On the contrary, the insularity of the climate is increased by the western coasts being much indented by the sea, and cut into numerous islets towards the northern end of the main island. Elongated points or peninsular prolongations also stretch out from various parts of the western side of the island, as those of Cornwall, Pembroke, Caernarvon, Wigton, Argyle, &c. And the climate of these seaward projections is consequently more maritime or subinsular, than that of an even coast line, with sea only on its front.

Commencing almost under the fiftieth parallel of latitude, at the north-west point of England, the main land of Britain extends northward beyond the line of 58, say to 58½; with the addition of another degree for the

Orkney Isles, off the north coast of Scotland. The outlying group of Shetland Isles will carry the range of latitude considerably farther northward; making the total range about eleven degrees, between the latitudinal lines of 50 and 61; small fractions disregarded. The full range of longitude may be called ten degrees; although nowhere is that width attained under the same parallel of latitude. The oblique position of the island and its islets, which throws almost the whole of Scotland on the western side of the longitudinal line which divides England into nearly equal halves, increases the range of longitude in proportion to the actual width. The more easterly longitudes of England thus become represented only by sea to the northward of latitude 53. This peculiarity renders it difficult to trace out any easterly tendencies of the plants. The few species restricted to the most easterly longitudes are also thus necessarily plants limited to the most southerly latitudes. Again, they are plants peculiar to the distant lowland, as opposed to the mountainous tracts; and also they have certain seeming geologic relations, whether purely accidental or causal. It is thus difficult to say with which of these geographic conditions they are in real relation or causal connexion.

2. *Extent and Area*.—The measurement from extreme south to extreme north of the main island, by the longest line, is stated to exceed 600 miles; the line crossing wide indents of the sea in parts of this length. The longest line that can be drawn over land, without crossing any considerable inlet of the sea, runs from Rye, in Sussex, northward or north-westward to Cape Wrath, in Sutherland; and this line is said to measure 580 miles. The longest transverse line, running in a direction from south-west to east or north-east, is traced from the Land's

End in Cornwall to a place near Lowestoft in Suffolk ; and this line is said to measure 367 miles. The width of the island, from east to west by a straight line, is everywhere much less, and in some parts would measure less than forty miles. The circumference by a wavy outline, and neglecting small irregularities, is about 2000 miles. But the length of coast or shore line, reached by tides, would be made quite 4000 miles by including estuaries and river banks, with creeks and other small inlets. In even numbers the total area may be reckoned at 88,000 square miles (Macculloch) ; but some authorities reduce it below 84,000 miles. The areas of the three ancient kingdoms, frequently mentioned in this work, may be given separately in square miles thus ;—

England 50,387. Wales 7,425. Scotland 29,600.

In Scotland the lakes occupy full 600 miles of this area. Wales is usually understood to be included with England, when the name of the latter is mentioned in botanical books ; especially so, if mentioned in contra-distinction against Scotland or Ireland. The areas of the other chief divisions, more formally used in this work, will be stated presently under the appropriate heads.

3. *Division into Counties.*—These old political divisions of Britain were found to be little suitable for the objects of phyto-geography. As a first step downward, in subdividing the three ancient kingdoms of England, Wales, Scotland, they were found to be inconveniently numerous. Their extreme inequality of size was also most inconvenient and objectionable ; the largest of them being more than a hundred fold the size of the smallest. Other divisions or sections of the surface were required instead, more equal in their dimensions, and bearing some better relation to the physical geography of the surface. By



utterly disregarding the old comital divisions, and tracing out an entirely independent series of districts, the required objects might have been met very completely. But the advantages thereby gained would have been attended with disadvantages so great as to become practically insuperable. An entirely new set of boundary lines would have been necessary, not in accordance with those laid down in existing maps; and which would thus have necessitated new maps, on a large scale, for tracing them out satisfactorily. Most of the local Floras and other lists of species, with arrangements and specifications of localities, have been made in reference to county limits; so that a large portion of our printed records would have been rendered much less available, by the adoption of other divisions which disregarded the old comital boundaries.

These and other considerations made a general adherence to the long-established county limits practically unavoidable, when fixing upon other sections to be used instead of the counties themselves, or jointly with them. Larger and fewer districts could be formed by uniting counties into provinces. Smaller and more numerous sections could be formed by dividing the great counties into vice-counties. To explain the former, it usually sufficed to name the counties which were united to form them, as was done in volume first, pages 16 and 17.

The vice-counties were traced on the lithographic map prefixed to volume third, and will shortly be further explained in the present volume. In this manner, phyto-geographers acquire other and more serviceable divisions of the surface, without losing the advantages of familiar names and fixed boundaries, traceable upon any ordinary map of Britain. At the same time the irregularity, inequality, and arbitrary character of the old

comital divisions are partially removed. Of the provinces and connected divisions some further account will be given immediately; a few facts on the inequality of area in the counties being first adduced.

In England, the counties vary from 5836 square miles, the area of Yorkshire, downward to 244 such miles for that of Flintshire. Rutland is still smaller, being only 149 miles; but it has not been reckoned as a separate county in this work. In Scotland, the counties may be said to vary from Perthshire, with an area of 2588 square miles, downward to Linlithgowshire, with an area of 120 such miles. The county of Inverness is larger than that of Perth; but it is nowhere in this work taken as a single county. And the two little counties of Kinross and Clackmannan, with areas of only 72 and 48 square miles, have been combined with their adjacent counties or vice-counties. Even after the absorption and division of those extremes, the counties retained in this treatise differ very greatly in size; that of Linlithgow being little more than one-fiftieth part the size of York.

4. *Provinces and Sub-provinces.*—The grouping of the counties into 18 provinces was amply explained in former volumes; namely, on pages 13 to 18 of the first volume, and on pages 422 to 428 of the third volume. It is trusted that some part of the practical convenience resulting from such unions has become apparent in this work. The provinces were first traced out several years ago, when botanical data towards showing distribution were much less ample than they have since become. The provincial districts were in some respects accommodated to then recorded knowledge of their botany. Thus, it was very desirable that none of them should be tracts so little examined, as to prevent the compiling of an approxi-

mately full list of their species or flora. And it was further desired, for sake of comparisons between their floras, that each one of these provinces should include some portion of coast line. Some slight differences would have been made in tracing out the Scottish provinces, if the botanical records relating to the counties and islands of that portion of Britain had been more complete, especially with reference to the commoner plants. Though many of the blanks in the areas of species, as traced out by provinces, can now be filled up, there are still too many remaining. The lists of species are yet much short of completeness and correctness for the provinces of North Highlands, West Highlands, Lakes, South Wales, and in less degree for some others.

The numerals given in the line of 'Area,' under the name of each species in former volumes, represent 18 local floras, one for each province. With the "additions and corrections" introduced into volume third, those numerals may be readily converted into local lists or floras for any or all of the provinces; such as would be approximately complete, though doubtless open to emendations by botanists with the requisite local knowledge. Of course such lists would represent only the state of information at the date when the corresponding portion of this work was written. Some blanks in the line of numerals are being filled up each successive year; and from time to time it is ascertained that some of the nos. were erroneously entered, through mistakes about the species on the part of local observers or otherwise. To form the list for any separate province, it is easy to take a copy of the 'London Catalogue of British Plants,' and to check the name of each species in accordance with the corresponding no. of the province in the line of 'Area.' Eighteen lists thus formed would afford serviceable data



for phyto-geographical purposes, when comparisons between small local floras are required. All being formed on the same principle, in regard to the disputed topics of native and alien species, of varieties and true species, &c., they become more strictly comparable than the like number of local lists made out by different botanists, whose views might differ widely in respect to such matters. The varying width of Britain, and other geographical conditions, caused the provincial areas to be still unequal, though far less unequal than those of the counties. And in this respect they are not equally comparable in respect to their floras.

Advancing knowledge has subsequently given facility for subdividing the 18 provinces into more equal and more numerous sections. For some purposes these secondary or sub-provinces will be found more serviceable in use than the larger and fewer provinces. They amount to 38 in number, and were explained on pages 324 to 328 of volume third. Their greater equality was obtained by keeping the smaller provinces unchanged, and subdividing the larger into two or three subordinate sections. The rule of adhering to comital boundaries was still observed in the sub-provinces, except that the single county of York was subdivided into the two provinces of East Humber and West Humber. Subprovincial lists of species might now be made out almost as complete as the provincial lists were at the date when the first volume of this work was written. Those for which the Author's lists of species seem to be least complete, are the Upper North Highlands, South-east Wales, South-west Lowlands, Inner West Highlands, Ebudes,—nearly in the order here enumerated. The dimensions or areas of the provinces and subprovinces may be thus given in square

miles, chiefly on faith of the figures cited for counties in Macculloch's Statistics of the British Empire :—

Provinces.	Area.	Subprovinces and areas.
1. Peninsula	5567	South, 1337. Mid, 2585. North, 1645.
2. Channel	5464	West, 2373. Mid, 1625. East, 1466.
3. Thames	7007	South, 2316. North, 2445. West, 2246.
4. Ouse	6247	South, 1515. North, 2024. West, 2708.
5. Severn	6764	South, 1754. Mid, 2483. North, 2527.
6. South Wales	4231	South-East, 1972. South-West, 2259.
7. North Wales	3194	North Wales, 3194.
8. Trent	5431	East, 2611. West, 2820.
9. Mersey	2552	Mersey, 2552.
10. Humber	5836	East, 2500 ? West, 3336 ?
11. Tyne	2968	Tyne, 2968.
12. Lake-lands	2551	Lakes, 2551. (Isle of Man.)
13. W. Lowlands	4732	South-West, 2525. North-West, 2206.
14. E. Lowlands	2485	East Lowlands, 2485.
15. E. Highlands	9828	South, 3664. Mid, 3228. North, 2936.
16. W. Highlands	5500	Inner, 3500. Ebudes, 2000.
17. N. Highlands	4766	Lower, 2325. Upper, 2441.
18. North Isles	2280	Hebrides, 1000. Orkney, 425. Shetland, 855.

5. *Latitudinal divisions.*—For brevity of expression, and to facilitate comparisons, the provinces may usefully be combined into larger geographical divisions, as substitutes for older and less comparable distinctions. England, Wales, Scotland, Lowlands, Highlands, very conveniently express certain divisions of Britain by single words. But they are not portions so well adapted for geographico-botanical comparisons, as some others which may quite readily be indicated as groups of provinces, and with little extra tax on the memory by new names. South Britain, Mid Britain, North Britain, may be the readily remembered names given to three convenient latitudinal divisions, traceable on a map thus :—

S. Britain includes prov. 1—7; subprov. 1—18.

M. Britain ..... 8—14; ..... 19—28.

N. Britain ..... 15—18; ..... 29—38.

A glance over the map in volume third will show these divisions better than verbal explanations; particularly so, if possessors of the volume will trace two lines of colour transversely along the two dividing boundaries. Each of the divisions may be said to extend across about three degrees of latitude, with the outlying addition of Shetland to the most northerly one; also some considerable irregularities with reference to the mathematical lines of latitude, through the wavy course of the lines which divide the provinces or counties, and in accordance with which these divisions are made. Each of the divisions has also its mountain ranges; an important condition towards the data for any true or equal comparisons between their respective floras.

South Britain has the widest area of low and open country, and relatively and absolutely the smallest extent of mountainous ground. The hills of Mid Britain are somewhat less elevated than are those of South Britain; three of the highest summits in Wales exceeding those of the Lake district in North England, where the highest hills of Mid Britain are found. The area of low and undulating plains, at all corresponding with the downs and intervening country of South-east England, is much less in Mid Britain; so that, viewed in the whole, the latter has more of the mountainous character than South Britain. In turn, North Britain is far more mountainous than the other two divisions; much exceeding them by the vertical elevation of its hills, as well as by their bulk and horizontal extent. The flora of North Britain is consequently more alpine or arctic than the floras of the other two more southerly divisions; the influence of the



Highland mountains being made evident in the addition of many boreal and arctic species to the British flora, which can flourish on the coasts and plains only in latitudes still more northern than those of Scotland; and which in this country are found only on and about the Highland mountains. The areas of these three latitudinal divisions may be given in square miles thus:—

S. Britain 38,474. M. Britain 26,555. N. Britain 22,374.

A flora for each of these three divisions will be given in the 'Summary of Distribution,' chapter V.

6. *Longitudinal divisions*.—These cannot be traced out so readily and satisfactorily as latitudinal divisions. Three are more desirable than two divisions for geographico-botanical objects. Only simple or single comparisons can be made between the floral statistics of two spaces; while three spaces may frequently serve to show a gradation of difference, be it in the total flora, or in the several orders or other groups of systematic botany. But three longitudinal divisions are found to be impracticable; leading to inequalities of area and altitude, which would vitiate botanico-statistical comparisons between the two sides of the island. Even two divisions cannot be traced in any close accordance with lines of longitude on maps, by reason of the oblique position of Britain and its islets, its inequality of width, and the narrowness of the main island, in parts where eastern and western coasts approximate with only short interspaces. The line of *Two West* from Greenwich cuts England into western and eastern halves. By giving to that line a waving obliquity from south-east to north-west, so as to correspond with the western boundary line of the provinces, longitudinal divisions of England are obtained, bearing sufficient approximation to geographical truth for

the purposes of this work. One exception must be made to the provincial boundaries in tracing out this line; the sub-province of West Channel being thrown into the western division of the island; while the two other sub-provinces of the same primary province are kept on the eastern division. Again, the far western extension of Yorkshire, even beyond the proper eastern water-shed, brings the province of Humber too near the western coasts for geographical correctness. Through this undue comital extension, some western localities are reckoned as eastern in the Census list of species; and they are also taken into account as eastern in the Summary of Distribution. Several other such anomalies as this one might be found in the map, but practical convenience rendered a close adherence to county boundaries, as before remarked, the paramount consideration in tracing provinces.

Almost the whole of Scotland is situate to the westward of the longitudinal line which bisects England. Though the line of *Four West* divides Scotland into two somewhat equal halves, that line also fails to separate the western from the eastern coasts; portions of each falling on the wrong side of the line. In order to continue our wavy dividing line northwards, we must trace it along the western borders of the East Lowland and East Highland provinces; that is, more in accordance with the water-shed than with the mathematical line of longitude. As a comital and provincial boundary, the line is arrested at the North Highlands, through the extension of that province and its counties from the eastern to the western coasts. Geographical position, climate and plants, and numerical convenience subsequently to be explained, all suggest that the North Highland province should be

deemed a western province, although it has a line of eastern coast likewise.

As to the three groups which together make up the province of the North Isles. One group is completely western, namely, the Hebrides; another is eastern by longitude, namely, Shetland; and the intermediate group of Orkney is eastern with respect to Scotland, western with respect to England. In climate and productions all three might appropriately go along with Western Scotland. In the Summary of Distribution they are so taken; and almost the only result of any importance is, that the one or two species peculiar to Shetland are there entered as exclusively western; namely, *Arenaria norvegica* and the more doubtful *Cerastium nigrescens*. It would have been a better geographical arrangement originally (if a paucity of botanical records had not then prevented) to have united the Hebrides with the West Highland province, instead of uniting these isles with the two more northerly and easterly groups. Botanically, it may be deemed indifferent with which of those two provinces the Hebrides are associated. They contain no plants peculiar to the group, and extremely few which are not recorded also for Orkney or Shetland; most of their species being common to both the latter-named groups.

The areas of the two longitudinal divisions, or more strictly those of the two sides of the island, here traced out, may be given in square miles thus:—

West Britain 43,823. East Britain 43,580.

The proportion of mountainous land is larger on the western side. In South Britain, only the western side is mountainous; the undulating plains of the South of England lying chiefly on the eastern side of the island. In advancing northwards, the eastern side becomes mountainous also. There is little difference between the abso-



lute height of the loftiest hills, those of one division compared with those of the other.

The local botany of West Britain is less fully ascertained than that of East Britain; the lists of species for several of the western counties being still very incompletely made out. Regarded as a whole, the Western flora is nearly as well ascertained as the Eastern flora; though some few segregate species, hitherto recorded only on the eastern side of the island, may eventually be found also on the western side. The letters "w. e." in the Summary of Distribution, V, give a separated flora for each side of the island. The substitution of blanks "-", instead of letters, will indicate the species whose presence in the one, and absence in the other, render the floras of the western and eastern divisions non-identical.

7. *Vice-Counties*.—The lines traced across the divided counties on the Map, in volume third, will scarcely suffice for botanists who may wish to distinguish these subordinate sections on other maps. To facilitate recognition the course of the dividing lines shall be given here by verbal explanation, adapted to the maps of England and Scotland, published under the auspices of the 'Society for the Diffusion of Useful Knowledge.' In thus subdividing the counties, any natural peculiarities were taken, or even well-marked lines traceable on maps, and findable on the actual ground; such as water-sheds, roads, canals, rivers, &c. — *East and West Cornwall* are separated by a line traced along the high road from Truro, through St. Columb, to the inland extremity of Padstow Creek. At the two ends of this line, the salt-water completes the division.—*South and North Devon* are separated by an imaginary line, adapted to the water-shed; commencing at the Tamar, about midway between Tavistock and Launceston;

passing over the ridge of Dartmoor, and joining the Western Canal at Tiverton.—*South* and *North Somerset* are separated by a line along the river Parret, from Bridgewater to Ilchester; and thence curving round to the northern extremity of Dorset.—*South* and *North Wilts* are separated by a line drawn along the Kennet and Avon Canal.—*South* and *North Hants* are separated by a line traced along the high roads from Winchester westward to Stockbridge, eastward to Petersfield; and continued thence to the borders of Wilts and Sussex.—*West* and *East Sussex* are separated by a line traced along the high road from Brighton to Cuckfield; and thence through Crawley to the border of Surrey.—*East* and *West Kent* are separated by the river Medway and its tributaries, nearly up to Staplehurst; and thence by the high road through Cranbrooke to the border of Sussex, near Hawkshurst.—*South* and *North Essex* are separated by the high road from Waltham and Epping to Chelmsford, and thence by the Blackwater river to the coast.—*East* and *West Suffolk*, and *East* and *West Norfolk*, are separated by the mathematical line of one east longitude from Greenwich; a line that may always be traced on a map, but inconvenient from not being a visible mark on the ground.—*East* and *West Gloucester* are separated by the Thames and Severn Canal, and by the river Severn from the point of conjunction up to Tewkesbury.—*South* and *North Lincoln* are separated by the Witham, from Boston to Lincoln; and thence by the Foss Dyke to the border of Nottingham.—*South* and *West Lancaster* are separated by the river Ribble. (That more northerly portion of Lancashire, which is situate to the north-west of the Bay of Morecombe, is taken with the Lake Province, and reckoned as a part of Westmoreland).—The great county of York is first divided into the two

sub-provinces of East and West Humber, by the rivers Humber, Ouse, and Wiske. *South-east* and *North-east Yorkshire* are then separated by the political line which divides the East Riding from the rest of the county; that portion of the East Riding situate westward of the Ouse being taken as part of the Mid-West vice-county. *South-west* and *Mid-west Yorkshire* are separated by the Leeds and Liverpool Canal, and by the river Aire below Leeds. *Mid-west* and *North-west Yorkshire* are separated by the political boundary between the North and West Ridings; that boundary being deflected westward so as to pass over Whernside to the south-eastern angle of Westmoreland, in conformity with the water-shed.—*Cheviotland* is cut off from the more southern part of Northumberland by the river Coquet, and a line continued to Carter Fell from the Linn Bridge. That part of Durham, which is situate between Holy Island and the Tweed, is deemed a portion of Cheviotland.—The large county of Perth is divided into three vice-counties. *East Perth* is cut off from Mid Perth by the rivers Garry and Tay. *Mid Perth* is separated from *West Perth* by a line traced over the high ground or water-shed so as to divide the tributaries of the Tay from those of the Forth; the little county of Clackmannan and a small detached portion of Stirling being taken as parts of West Perth.—*South* and *North Aberdeen* are separated by lines traced along the water-sheds eastward and westward from Inverury.—The great county of Inverness is first divided by the line of water-shed between the eastern and western sides of Scotland, continued along Loch Erriicht to the borders of Perthshire. The easterly portion, with the addition of Nairnshire, forms the large vice-county of *Easternness*. That portion of Inverness, which cuts *Elginshire* into two disjointed parts, is deemed to be a portion of this latter



county.—The remainder of Inverness, the waters of which drain to the western coast, along with the detached portion of Argyle which is situate to the north-west of Loch Linhe, make up the vice-county of *Westernness*.—*Main-Argyle* and *Cantire* are separated by the Crinan Canal.—The *Clyde Isles* include Bute and Arran, with Cumbray and other small islets adjacent, between Cantire and Ayr.—The *Ebudes* are islands belonging by political geography to Argyle and Inverness. *South Ebudes* include Islay and Jura, with adjacent islets. *Mid Ebudes* consist of Mull and Coll, with their adjacent islets. *North Ebudes* include Skye and Rum, also with their adjacent islets.—*East* and *West Ross* are separated by a line traced along the water-shed between the eastern and western coasts; East Ross being considered to include those detached portions of Nairn, situate to the westward of the Murray Firth and Loch Beaully; and the fragmentary county of Cromarty as belonging to East or West Ross, according to the geographical position of its detached fragments.—*East* and *West Sutherland* are also separated by the line of water-shed; this being so traced as to divide the south-eastern portion of the county from the western and northern.—The other counties being undivided into vice-counties, their boundaries are those shown on any maps, and do not call for special explanation.

8. *Altitude of surface*. — The mountains of Britain are not sufficiently elevated to retain snow on their summits through the year. But in depressions which face from the south, and under the northern aspect of steep rocks, snow may be found in isolated patches on the hills of North Britain throughout the summer. It may thus be said that the hills are high enough to enter the line of

perennial snow-patches or snow-drifts, without attaining the true line of perpetual snow. The highest hills of Perthshire rise almost to 4000 feet of vertical height; but no patches of snow are usually found on them so late as July and August. The highest hills of Inverness and Aberdeen exceed 4300 feet; and on those hills, far below the extreme summits, small patches of snow usually or always remain unmelted until the new snow of another winter again covers them. There is thus very little surface which is constantly irrigated in summer by water trickling over it at the temperature of melting snow. Plants peculiarly adapted to such situations are consequently almost absent from the flora of Britain. *Saxifraga rivularis* and *Stellaria cerastoides* are perhaps the nearest representatives of the plants alluded to.

Some diversity of opinion, or rather inexactness of knowledge, still exists in respect to the altitudes of the highest hills. Recently it has been stated that the highest summit, that of Ben Nevis, in Westernness, slightly exceeds 4400 feet; and that the summit of Benna-muic-dhu, in South Aberdeen, falls short of 4300 feet. More usually these two hills have been regarded as nearly equal competitors for the first place in point of absolute height above the sea; the priority between the two being most frequently assigned to Ben Nevis. Adopting the three latitudinal divisions before explained, their highest hills may be stated in English feet thus:—

S. Britain 3571. Mid Britain, 3166. N. Britain 4374. Supposing the two hills above mentioned to be respectively the highest in the Western and Eastern divisions of the island, then Ben Nevis may be said to give a slight predominance of 100 feet, more or less, to West Britain. There is probably a larger extent of surface elevated

above 4000 feet in East Britain; a larger extent above 3000 feet in West Britain. The higher hills of England being situate on the western side of the island, and the highest being in the northern and western counties of Cumberland and Caernarvon, their general tendency is a gradually increasing altitude from east to west. And although the hills in the south-westerly province of the Peninsula are much less elevated than others further northward, they are still nearly double the height of those in the provinces of Thames and Channel; so that the tendency to increased height westerly is shown even to the most southern of the provinces. The line of Two West Longitude so divides Britain as to place nearly all the high hills on its western side. The 'Scale of Altitude,' as given on the Map in volume third, will illustrate the increasing height of the provinces in a northerly direction, and likewise the greater height of the westerly provinces, more especially in South Britain. An error occurs in the Scale, in the cones over 18 b and 18 c, which are intended to represent the subprovinces of Orkney and Shetland. The lithographer should have carried these cones one line higher, and drawn them slightly over and slightly under the line of 500 yards, instead of that of 400 yards. Perhaps the cone for the province of Humber, no. 10, should also have been a little higher, about midway between the lines of 800 and 900 yards. The altitudes of the Subprovinces may suffice to show also those of the Provinces, in English feet, as underneath:—

Western.	Eastern.
1011 West Channel.	917 Mid Channel.
1368 South Peninsula.	858 East Channel.
1792 Mid Peninsula "2077."	993 South Thames.
1668 North Peninsula.	904 North Thames.
1852 South Severn.	905 West Thames.
1447 Mid Severn.	— ? South Ouse.



Western.	Eastern.
1806 North Severn.	— ? North Ouse.
2862 South-east Wales.	804 West Ouse.
2463 South-west Wales.	— ? East Trent.
3571 North Wales.	2150 West Trent.
1803 Mersey.	1485 East Humber.
3166 Lake lands.	2580 West Humber.
2635 South-west Lowlands.	2658 Tyne.
2552 North-west Lowlands.	2741 East Lowlands.
4374 Inner West Highlands.	3945 South-east Highlands.
3000 Ebudes. "3168."	4300 Mid-east Highlands.
3720 Lower North Highlands.	4100 North-east Highlands.
3230 Upper North Highlands.	1590 Orkney.
2700 Hebrides.	1470 Shetland.

Some authorities make the West Lowlands and North Highlands considerably higher than is indicated by the figures above ; namely, 3000 and 4000 feet. A copious compilation of altitudes for the several counties may be seen in the small volume published in 1836, under title of 'Remarks on the Geographical Distribution of British Plants.'

9. *General climate.*—The geographical position of England induces peculiarities of climate, which doubtless affect its flora, and thus induce in turn corresponding peculiarities of its vegetation. In the broad or general view the fact seems obvious enough. Yet is it difficult, even to present impossibility, to trace out very special connexions between plants and climate. In its relations to plants, climate involves most varied combinations of temperature and humidity, of exposure to sun and wind, shade and shelter, &c., &c. If time and place are both taken into account, by the season of the year, the character of the locality, and other circumstances, the combinations become endless in their variety and proportions. Only some of the leading characteristics,

and general indications subject to many local exceptions, can be attempted here.

By its insularity Britain has the dampness and equability of temperature which are usual characteristics of insular climates. Its proximity to Europe, with only a narrow channel intervening, induces some approach to the continental character of climate, in the inland and south-eastern counties of England; especially so between latitudes 51 and 53. On the contrary, the influence of the gulf-stream on the western coasts tends to increase the insular characteristics here, by affording a constant supply of comparatively warm water, and consequently also of water-warmed air; the moisture of which becomes visible in clouds, and palpable in mists and rains, on passing to the cooler surface of the land. The winters of Britain are thus rendered less cold, than would otherwise be anticipated from its northern latitude; while the summers are rendered less warm; both seasons being more damp. This result is not wholly lost even in the most easterly provinces of England, although considerably reduced there. In addition, the alternations of weather, from damp and mild to dry and cold, are frequent and rapid; thus making the climate proverbial for its variability. But their frequency of repetition is more remarkable than the extent of the changes; for the climate is seldom in any extreme, either of cold or of drought, and still less in that of heat. Serene weather in summer occasionally dries and heats the ground so far as to become a drought injurious to vegetation; particularly to garden plants and cultivated crops in the counties round London. More commonly, a few days of unusually high temperature are followed by thunder-showers, which restore damp and coolness to the ground, and consequently also to the air.

The prevailing winds are from south-west, and east or north-east; the former being damp and mild; the latter being dry and cold. In summer, the easterly winds frequently blow from south-east instead of from north-east; and they are then warm winds. Perhaps, the most marked peculiarity in the winds of Britain, by its effect on the vegetation, is a customary prevalence of westerly winds through much of the winter, succeeded by north-easterly winds in spring. The growth of many herbaceous plants, and of the buds of trees, is thus prematurely promoted, to be subsequently checked by the dry cold winds of spring. Injurious effects so induced are more conspicuous among garden plants, which have been introduced from dissimilar climates. But it is not unusual for the oak-trees, ferns, and other native plants to be severely damaged in spring by late frosts, consequent on the clear sky at nights during the period of vernal east winds.

10. *Rain and Humidity.* — The absolute quantity of rain which falls, and the number of days on which some rain falls, are both greater on the western side of the island than on the eastern. The proportions are somewhere about 4 and 3, or perhaps nearer 3 and 2. For the east and west the yearly average of rain has been stated at 32 and 24 inches. The local variations are very wide. According to the reports of various local observers, some spots among the hills in the north-west of England receive more than four times the amount of rain-water, if compared with other spots in the vicinity of London. Thus, according to the 'Tabular View' published by Mr. Joseph Atkinson, the fall of rain at Esthwaite Lodge and Coniston Lodge, North Lancashire, amounts to 86 and 85 inches annually; while at



London and Cambridge it averages only 20 inches. This extreme diversity puts in contrast the humidity of the hills of Mid-west Britain against the open country of South-east Britain. The diversity is much less when a contrast is made between eastern and western counties apart from high hills.

The rain which falls on the eastern side of the island probably descends in a shorter number of hours, in proportion to its absolute quantity, and comparatively with that which falls on the western side. The atmosphere of East Britain is thus comparatively less humid and less cloudy than would be implied by reckoning only the quantity of water, or even the number of days on which rain falls. These differences affect the general vegetation, and perhaps to a small extent also the respective floras. Plants adapted to a damp and dull climate become less frequent on the eastern side of the island, although they may still occur there in certain favorable spots,—in swamps and marshes, near stream sides, in the shade of woods, or sheltered from sun and drought in narrow and humid ravines. The differences are thus not so much in the species, though apparent in the general vegetation. They are to be observed in the greener and more luxuriant growth of many plants, and in the comparative abundance of ferns, rushes, sedges, willows, mosses, and other damp-seeking plants, on the western side. Some of the species, specially adapted to a damp and equable climate, are absolutely restricted to the western or south-western counties, and seemingly because they are destroyed by the severity of frosts on the eastern side.

The hills are more humid than the plains and other low grounds. If not so by the absolute quantity of rain which falls on them, they are so by the frequency of their

showers and mists. Dry and sunny days are not unfrequent in immediate proximity to the hills, while their summits and sides are enveloped in drizzling mists, or crossed by driving showers. Rain often prevails in the internal valleys among the hills, while the surrounding country on their outskirts remains free from wet. The western hills are thus peculiarly the land of moisture, both by position and by elevation. The climate of North Britain is more humid than that of South Britain, in connexion with the hilly surface of the former, comparatively with the low plains of South England. But the hilly portions of the latter almost emulate those of the former in humidity. The peculiarities of the western flora and vegetation, before adverted to, are increased in the mountainous districts, except that the plants which are unfitted to bear low temperatures, and thus apparently adapted only to the south-western counties, are absent from the northern hills, equally as from the eastern plains.

The subjoined list of western and eastern subprovinces will convey some idea of the rain-fall on the two sides of the island. The figures which are prefixed to the names show the yearly quantity of rain in inches, as reported by observers in many different places. For some of the subprovinces no local reports have been obtained; for others, only those of one spot; for others, again, the figure is an average from records for several different spots. The whole include about a hundred places, very unequally apportioned to the provinces. The figures can be given only as approximate truths:—

Western.	Eastern.
43. South Peninsula.	32. Mid Channel.
36. Mid Peninsula.	30. East Channel.
30. North Peninsula.	29. South Thames.
West Channel.	24. North Thames.

Western.	Eastern.
30. South Severn.	25. West Thames.
27. Mid Severn.	25. South Ouse.
North Severn.	25. North Ouse.
34. S.E.-Wales.	23. West Ouse.
S.W. Wales.	27. East Trent.
North Wales.	27. West Trent.
39. Mersey.	25. East Humber.
61. Lakes.	33. West Humber.
36. S.W. Lowlands.	34. Tyne (55, 21, 25).
40. N.W. Lowlands.	24. East Lowlands.
53. I.W. Highlands.	41. S.E. Highlands.
Ebudes.	30. M.E. Highlands.
L.N. Highlands.	27. N.E. Highlands.
U.N. Highlands.	40. Orkney (1 year).
Hebrides.	Shetland.

The average of the Tyne province is raised by the high figure of 55, reported for Allenheads, situate high on the hilly western side of the province. The average for South Thames is augmented through the comparatively high figure of 37, reported as the annual average at Dover. In some other provinces the local differences are very wide; the average for the Lake province being obtained from the following very unequal figures, reported for different spots, 32, 34, 53, 55, 67, 75, 85, 86.

11. *Temperature*. — In a general view, the temperature of the air and ground may be stated to decrease slowly from south to north, more rapidly from lower ground to higher ground, and slightly also from the coast line to places more inland. The mean temperature of the south-western coasts of England, and possibly also of the whole line of western coast in Britain, is somewhat higher than that of the eastern coast under similar latitudes. Configuration of surface, the character of the ground, and other local conditions also affect the mean temperature;



so that general rules become subject to various local exceptions.

Moreover, general rules which may be correct for the average of the whole year, are found to be unequally applicable at different seasons. Thus, inland places are usually warmer in summer; although during much of the year, and more especially in winter, their temperature is decidedly lower than that of the coast line under equal latitude. The counties of Cornwall and Devon, celebrated for their mild and equal climate, have a summer temperature below that experienced in the inland counties of the Thames and Ouse provinces; which being farther north, farther east, and more inland, have a lower general mean for the year, and a much lower winter temperature. The differences between the mean temperatures of summer and winter are less on the west than on the east side of the island, less on the coast than in inland places, and probably somewhat less in the north than in the south. The full result is made obvious in the higher summer temperature for the inland south-eastern counties of England, than is found elsewhere in Britain.

In course of the past half century numerous records have been printed, which purport to show the results attained from daily registers of the thermometer in various parts of the island. Many of them show the yearly average of the daily means, as deduced from the daily extremes. Some few have been deduced from hourly or half-hourly observations, carefully made and calculated, expressly as local standards for comparison. For the greater number, observations of the thermometer have been made at stated hours, usually twice a day. The result obtained by adding or subtracting the difference between the temperature at the stated hours and

that for the whole twenty-four hours, at some neighbouring place, becomes the *corrected* mean temperature.

Unfortunately, when brought together, many of those records are scarcely to be reconciled one with another. Some years are rather colder or rather warmer than the average for a series; and it is seldom possible to compare the same number and series of years for many different places. Instruments differ in their graduation, one compared with another. The situations in which they are fixed, are not always the best adapted for giving true indications at all times and seasons. And observers are themselves more or less inexact; besides having to appoint deputies to observe for them during occasional absence. The chances and sources of error become altogether somewhat numerous; although several of them may tend to neutralize each other in the averages, by leading to some figures being given in excess, while others are given in deficiency.

This is not the place or opportunity to write an essay on thermometrical registration. Tables of recorded temperature may be found in published works on meteorology, physical geography, phyto-geography, &c. Some such tables relating to the climate of this country were introduced into the little work published by the same writer full twenty years ago, under title of 'Remarks on the Geographical Distribution of British Plants.' After the lapse of a score of years those tables might now be greatly extended and improved. But it is feared that if thus re-written and enlarged, and accompanied by sufficiently ample explanations and needful qualifications, they might become too far lengthened in proportion to the pages that could be spared for them here. And at last, they would still be only a collection of details and almost unconnected facts. Instead, an attempt will now

be made to deduce from the mingled mass some sort of rules or formulas, which may be more readily recollected by their uniformity, and thus become more applicable to botanical purposes; although any forced uniformity will be a deviation to some extent from at least a portion of the actual registers.

12. *Relation of Mean Temperature to Latitude.*—Published records mostly agree in showing 47 or 48 of Fahrenheit's scale, with some fraction or decimal added, for the mean annual temperature of places in Mid Britain, not raised much above the level of the sea. But local discrepancies are here too numerous and conflicting, without really being very wide, to allow of any rate of variation being quite satisfactorily fixed, so as to connect the temperature with the latitude in an uniform manner. It would be possible to select one series showing a decrease of mean temperature from south to north,—another series seeming to prove the contrary, or an increase from south to north,—and a third series that would half contradict both, by its alternations of increase and decrease. Still, the prevailing character seems to be a slight decrease of mean temperature in a northerly direction, and a somewhat greater decrease of summer temperature in the same direction. Passing hence into the two other latitudinal divisions, those of South Britain and North Britain, the direction of decrease in temperature becomes clear enough, and a rate of decrease not so difficult to decide upon by way of general rule.

In South Britain, it might at first thought seem reasonable and safe to look to the registers for London, as kept for the Royal Society during a long series of years, and regularly published up to a late date, apparently under the sanction of the Society's officers. But



Luke Howard long ago showed that the recorded temperatures were too high; more truly indicating the artificial warmth of a large town, than the real climate of its latitude or geographical position. Succeeding observers have corroborated this view; but still various writers have gone on parrot-wise repeating and citing the registers of the Royal Society, to the neglect of much better records. Consequently, the mean temperature of London is commonly given as 50 of Fahrenheit and upwards, in tables of temperature compiled by foreign authors, equally as by those of England. In his 'Climate of London' Howard made the mean temperature of the vicinity of the Metropolis, at the distance of a few miles, only  $48\frac{1}{2}$  of Fahrenheit; a temperature which appears somewhat below truth. Other observers have stated 49, usually with a fraction or decimal over, as the result of their registers in the neighbourhood of London. It would hence seem that no wide error can be committed in assuming 50 Fahrenheit, as the mean temperature at the level of the sea, in latitude 51, that is, half a degree southward of London.

Towards the extreme south-west of England (Penzance, Helston, Plymouth) thermometrical registers give so high a mean as 52; which would be a rise of two degrees in temperature for a single degree of latitude. This may be considered a local and exceptional case; the high mean temperature decreasing rapidly eastward as well as northward. On the coasts of Dorset and Hants, the mean appears to be about 51 of Fahrenheit. It has been asserted that Malvern, situate near the conterminous borders of Worcester and Hereford shires, far inland and some height above the sea-level, has an annual mean rather exceeding  $49\frac{1}{2}$ . And a higher mean has been given for Cheltenham, in the inland part of Glou-

cestershire, a portion of the same province of Severn. But implicit reliance cannot usually be placed on the high and equable temperatures which are recorded for places of invalid resort, by medical practitioners and others interested in publishing the most attractive accounts of their local climates. The mean of 50 may, however, be near truth for the coasts of the Bristol Channel, decreasing inland and northward.

Looking to North Britain, records show a mean of 47, with a fraction under or a fraction over that figure, for low situations in the most southerly portions, that is, in the sub-province of the South-east Highlands. Those for the town of Inverness, by registers in different years, show a remarkable discrepancy; being formerly stated at  $48\frac{3}{4}$ , and more recently at  $45\frac{1}{4}$ . Taking the mean between these two, it would be 47, which seems more than sufficiently high for that northern locality, with the elevated ranges of the Grampian hills to the southward, and other lofty hills to the westward also. Judging either by the geographical and topographical position, or by the actual vegetation, the temperature on the north side of the Grampian hills should certainly be below that on the south side. So that, reverting to the two figures above mentioned, it may be surmised that the mean of  $45\frac{1}{4}$  will be something nearer to the true average than that of  $48\frac{3}{4}$ .

Northward from Inverness the records become too short and uncertain for much trust. For Wick, on the coast of Caithness, means of  $45\frac{1}{2}$  and very slightly under 47 have been reported, say  $46\frac{1}{4}$ . At Stromness, in Orkney, the mean is stated to be rather higher than  $46\frac{1}{4}$ ; and exactly the same figure is recorded for Sandwick, in the same isles. The hypothetically corrected mean for Unst, in Shetland, would appear to be under 45 of Fahrenheit (see vol. 2, page 4). Likely enough, the

maritime position of the four last-mentioned places may induce slightly higher means for the year, than would be found at more inland places in the same latitude.

On putting together the preceding figures, and also those for several other places not specially mentioned here, it appears that half a degree of Fahrenheit's scale, to one whole degree of latitude, will fairly enough represent the rate of decrease in temperature, when traced from south to north. By assuming this rate of decrease to be even and uniform, it becomes applicable as a rule towards estimating the climate for plants comparatively with each other. And further, on the grounds before adverted to, it has been assumed that fifty may be about the mean temperature on the latitudinal line of 51, at the level of the sea. A starting figure, and a rate of decrease northward, being so obtained, the mean annual temperature of the island, in its relation to latitude, and for places at or reduced to the sea-level, may be set forth thus:—

Lat. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61.

Temp. 50.  $49\frac{1}{2}$ . 49.  $48\frac{1}{2}$ . 48.  $47\frac{1}{2}$ . 47.  $46\frac{1}{2}$ . 46.  $45\frac{1}{2}$ . 45.

The half degrees of latitude will correspond with the quarter degrees of temperature. And if it be wished to avoid smaller fractions or decimals, in applying this scale to botanical purposes, all localities may be regarded as if under the even geographical line of latitude, or the intermediate half degree, to which they are nearest. The errors of mis-position in this way could never exceed fifteen geographical miles; while those of temperature could at most amount to only one-eighth of a degree, in variation from the standard scale, or less than the probable fallacies of the scale itself.

Along the south coast of England, the changes of temperature almost cease to be questions of latitude; rather becoming those of longitude and increased insularity;



especially so for the peninsular elongation situate between the English and Bristol Channels. Starting here from the extreme south-west, the assumed means on the coast line may be 52 for Cornwall,  $51\frac{1}{2}$  for South Devon, 51 for Dorset and Hants, and  $50\frac{1}{2}$  for Sussex; becoming 50 for the south-east coast of Kent, and also for the coasts of the Bristol Channel, as before intimated.

Supposing the scale above given to be that for the east coast of Britain, from Kent to Caithness, with Orkney and Shetland, two questions arise on it. First, can the same scale be applied along the western coast? Secondly, can the same scale be likewise applied to inland places? Thermometrical registers for places on or near the western coasts have been sparingly put on record; so that facts are inadequate to afford a satisfactory answer to the first question. For the present, the same scale may be deemed applicable also to the western coasts; though one quarter or even half a degree of additional mean temperature might perhaps be correctly given to islands and elongated points or peninsulas, on the western side of Britain. The scale may possibly be found somewhat too high for inland places. But it is to be understood as the sea-level temperature. And as inland places have usually some appreciable elevation above the sea-level, there will always practically be a deduction to some extent, when the scale is applied to inland places. For those of slight and unknown elevation, as 25 yards or less, the deduction of one quarter of a degree may be taken. For those more raised above the sea, the scale of decrease for altitude may be resorted to, as will presently be explained.

Fahrenheit's thermometer is still adhered to here, as in the preceding three volumes, on account of its greater familiarity for English botanists. A change to the centigrade thermometer is however highly desirable, in

conformity with the usages of the most scientific nations of the Continent. The centigrade thermometer might even now give increased facility for a scale to connect mean temperature with latitude, by aid of decimals and minutes, without the inconvenience of less exact fractions in the form of quarter and half degrees. The sea-level temperature, in latitude 51 at the south-east angle of England, was considered above to be represented by 50 on Fahrenheit's scale. This is equal to 10 on the centigrade scale. And in allowing one-hundredth of a degree of centigrade temperature, as a decrease for every two minutes of latitude northward, a descending scale is obtained which differs very little from that of half a degree of Fahrenheit's thermometer for one whole degree of latitude. Each minute or geographical mile would thus be understood to correspond with 0.005 of centigrade temperature; two minutes with 0.01; sixty minutes with 0.3, the decimal figure for a whole degree. The scale would run thus:—

Lat.	51	52	53	54	55	56	57	58	59.
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Temp.	10	9.7	9.4	9.1	8.8	8.5	8.2	7.9	7.6
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Reckoned in this manner, the rate of decrease northward would be very slightly slower or less than that before given as adapted to the thermometer of Fahrenheit. It is true that either of these rules, for connecting the thermometrical scales with geographical latitude in Britain, involves a kind of forced uniformity, more precise and even than may be warranted by recorded facts. But inasmuch as they are both deduced from the thermometrical registers of temperature, as recorded for many different places, they will in the main be found to represent those facts without much deviation from the most correct among them.

13. *Relation of Mean Temperature to Altitude.*—So few and unsatisfactory are the data on which to ground a scale for decrease of temperature in connexion with ascending altitude, that any attempted scale or rate of change must be proposed rather as provisional and conjectural than anywise certain. It can be offered or received only as an approximation to natural truth. Hourly observations of the thermometer at Inverness and Kingussie, in the years 1838 and 1839, are reported to have given a difference slightly exceeding  $2\frac{1}{2}$  of mean temperature for 220 yards of ascent. In even numbers this would seem to indicate a rate or relation of one degree of temperature for something less than 90 yards of ascent in North Britain. Inverness is situate on the coast, and Kingussie at 40 miles inland; a difference which may rather tend to accelerate the decrease of temperature. The recorded mean temperature for Lead-hills in Mid Britain, situate 1280 feet above the sea, is rather under  $44\frac{1}{4}$ , as observed at 6 and 1 o'clock, and corrected for the slight excess of those two hours together over the averages deduced from the half-hourly registers at Leith Fort. The assumed sea-level temperature for the latitude may be called  $47\frac{3}{4}$ ; thus giving about  $3\frac{1}{2}$  for the fall of the thermometer in 1280 feet; being at the rate of one degree of temperature for 366 feet, or one of temperature for 122 yards. It has been reported that the difference in the mean annual temperatures at Bywell and Allen-heads, in Northumberland, respectively at 50 and at 1360 feet of elevation above the level of the sea, amounts to 4.7 of Fahrenheit. This fall of the thermometer, for a height of 1310 feet, is equal to one degree of temperature for 278 or 279 feet of ascent.

According to Mr. John Welsh, the following average results in feet are equivalent to one degree of Fahrenheit,



as deduced from observations of the thermometer during four balloon ascents; the first and fourth relating to heights up to 4000 feet, the second and third respectively to 7000 and 2700 feet:—

August	17,	average	277.9 feet.
	26,	„	281.8 „
October	21,	„	279.3 „
November	10,	„	266.0 „

Whether the average of these four figures, 276 feet or 92 yards, will correctly represent the mean annual decrease of temperature in connexion with ascending altitude, near the surface of the ground, it is yet impossible to say. In making observations with the barometer and sympiesometer, in order to ascertain the altitudes at which plants were found on the mountains of Britain, the writer of this volume had constant occasion to note the temperature of the air. Many of these notes still exist; but as they are not simultaneous for different altitudes, they cannot be relied upon as very exact or serviceable data in the matter under present consideration. They appear on a rough average to indicate less than 100 yards of ascent for a decrease of one of temperature by the thermometer of Fahrenheit. Mr. Galbraith reduced the rate of decrease to 70 yards for one degree of temperature. Professor Leslie deemed 100 yards nearer the truth.

The temperatures of spring water may afford some additional data towards showing a rate of decrease in connexion with ascending altitude. The temperature of spring water at Lead-hills is stated to be 44, at an altitude of 1280 feet. The mean of two springs at Colinton, near Edinburgh, at 290 feet of mean altitude is reported to be something over  $47\frac{1}{2}$ ; being rather more than  $3\frac{1}{2}$  difference of temperature for nearly 1000 feet of ascent, say one degree of the thermometer for 280 feet or 93

yards of ascent. If an allowance be made for the difference of latitude between Lead-hills and Colinton, these figures will be reduced.

In Otley's Guide to the Lakes, it is mentioned that Brownrigg Well, a spring at the height of 2750 feet on Helvellyn, a few miles from Keswick in Cumberland, has a temperature of 40 to 42 in the summer months. The annual average of a spring or springs near Keswick, at 250 feet of height, is stated to be  $46\frac{1}{2}$ . In comparing the temperatures of these two altitudes, the lowest summer temperature of Brownrigg Well must be taken; and even that may be too high for an annual average. The difference of  $6\frac{1}{2}$  of temperature for 2500 feet of altitude, gives a rate of 385 feet or 128 yards for one degree of temperature in Cumberland. Coupling this rate of decrease with that for Colinton and Lead-hills, we obtain a mean of 332 feet or 110 yards for one degree of temperature. Or, making a direct comparison between Brownrigg Well at 40, and Lead-hills at 44, the difference of height is 1470 feet for 4 degrees of temperature; to which half a degree of Fahrenheit ought to be added for difference of latitude; giving a rate of 326 feet of ascent for one degree of temperature.

In August, 1832, the small spring well near the top of Ben Nevis, say at 3800 feet, had the temperature of 39. A more copious spring at the height of 2200 feet, gushing out on the moor above Loch Eil, some few miles from the well on Ben Nevis, had the temperature of 43, at the same date. This gives a rate of 400 feet for one degree of temperature. But very probably the temperature of the small spring on Ben Nevis was more raised in proportion to its altitude, than was the copious spring on the lower moors, at that season of the year. Indeed, in July

and August of other years, so high a temperature as 39 was not indicated by mountain springs in Aberdeenshire, Forfarshire, and Perthshire, except by those below 3000 feet of altitude.

The temperatures of twenty-three springs on the Grampian mountains, about latitude 47, in the East Highlands, were noted down in July and August of 1841 and 1844. The discrepancies between these were so considerable, as to render an average deduced from the whole far from satisfactory; although it may be the best yet attainable. The temperature of the highest of these springs was 37, at the altitude of 3450 feet in Aberdeenshire, on July 12, 1844. On comparing twenty-one others, each one in succession with this highest spring, their average rise of temperature is found to be at the rate of one degree of Fahrenheit for 322 feet of descent. In making this average the note for one of the springs is rejected, on the supposition of some error; as it indicates only half a degree of the thermometer for a difference of 700 feet in altitude.

Extreme exactness cannot be attained; and while this is the case, it may be well to adopt some rule which will adapt itself to our instruments, and can be readily applied to botanical objects. On the figures above given, there can be no wide error in assuming the relation of temperature and altitude to be at the rate of one degree for one hundred yards; that is, a decrease of temperature at the rate of one degree of Fahrenheit's scale for each hundred yards of ascent. This rate may likely be somewhat too rapid for the temperature of the ground, as measured by that of springs. On the contrary, it may perhaps be rather too slow for the decreasing temperature of the air, not close to the surface of the ground. The growth of mountain plants, seldom rising many inches



above the surface of the ground, must be under the joint influence of atmospheric and terrestrial temperature; and the rate of one degree of Fahrenheit's scale for one hundred yards of ascent, may be held at present to represent nearly such a mean. Suppose it to differ so much as one-tenth from the true rate; that the rate of decrease upwards should be one degree for 90 yards or for 110 yards instead. Such a variation of one-tenth from the assumed standard, either way, would be less than the variations which arise at equal levels from local conditions; for instance, from the humidity or dryness of the ground, the configuration of its surface, its inclination to or from the sun, &c.

Hitherto, the thermometer of Fahrenheit has been alone looked to, in thus attempting to connect temperature with altitude; and the subdivision of the degrees marked on its scale has been made only into the halves and quarters, as being more familiar to English readers. In what manner will it be most easy to substitute the centigrade scale for that of Fahrenheit? Fortunately, the former will accord better with the supposed rate of decrease in atmospheric temperature, than the scale of Fahrenheit. By allowing half a degree of the centigrade thermometer for each hundred yards of ascent, a rate of decreasing temperature is formed, which differs about one-tenth from that adapted to the thermometer of Fahrenheit. It will so represent a slower rate of decrease, and be more closely in accordance with several of the figures before given; those of the balloon ascents excepted. By resorting to the decimal subdivisions of the centigrade scale, we obtain a very facile mode of applying the proposed rate to the altitudes of plants; because one-tenth of a degree will then correspond with twenty yards of ascent; one-hundredth of a degree with

1. *Assumed temperature for different altitudes.*

Yards, in	52	53	54	55	56	57	58 lat.
—	9.7	9.4	9.1	8.8	8.5	8.2	7.9
100	9.2	8.9	8.6	8.3	8.0	7.7	7.4
200	8.7	8.4	8.1	7.8	7.5	7.2	6.9
300	8.2	7.9	7.6	7.3	7.0	6.7	6.4
400	7.7	7.4	7.1	6.8	6.5	6.2	5.9
500	7.2	6.9	6.6	6.3	6.0	5.7	5.4
600	6.7	6.4	6.1	5.8	5.5	5.2	4.9
700	6.2	5.9	5.6	5.3	5.0	4.7	4.4
800	5.7	5.4	5.1	4.8	4.5	4.2	3.9
900	5.2	4.9	4.6	4.3	4.0	3.7	3.4
1000		4.4	4.1	3.8	3.5	3.2	2.9
1100		3.9				2.7	2.4
1200		3.4				2.2	1.9
1300						1.7	1.4
1400						1.2	
1440						1.0	

two yards of ascent. The conversion of altitude into its corresponding temperature, or of temperature into its corresponding altitude, will thus be greatly facilitated for botanical purposes. Through this facility of mutual conversion, it will become possible to compare the relative heights attained by plants under different latitudes within Britain; more especially so, if the centigrade scale be used in making the needful allowance and correction for differences of latitude also. The two Tables introduced above, 1 and 2, will suffice to exemplify this relation of temperature to altitude and latitude. It is not to be expected, however, that any such uniform rate will be exactly borne out by the ever-varied realities of nature. But having observed and recorded facts for its basis, the scale or rate will be found approximately true as a general average, even although it should appear decidedly untrue in some localities.

In attempting to place plants according to their climatal

2. *Assumed altitude for different temperatures.*

Temp.	in 52	53	54	55	56	57	58 lat.
9.5	at 40 yards.						
9.	140	80	20				
8.5	240	180	120	60	0		
8.	340	280	220	160	100	40	
7.5	440	380	320	260	200	140	80
7.	540	480	420	360	300	240	180
6.5	640	580	520	460	400	340	280
6.	740	680	620	560	500	440	380
5.5	840	780	720	660	600	540	480
5.	940	880	820	760	700	640	580
4.5		980	920	860	800	740	680
4.		1080	1020	960	900	840	780
3.5		1180				940	880
3.						1040	980
2.5						1140	1080
2.						1240	1180
1.5						1340	
1.						1440	

relations, or to compare the climatal places of different species together, some such scales as here proposed become indispensable. For example, let it be supposed that one species of plant ascends to 600 yards of elevation in North Wales, in latitude 53; also, that another species ascends to 400 yards on the hills of Scotland, in latitude 57. It is wished to determine which of these two species should be placed above or below the other in a series arranged according to relations with climate, so far as those relations arise from or correspond with mean temperature. The height of 600 yards in latitude 53 corresponds with the temperature of 6.4 in the first table; and the height of 400 yards in latitude 57 corresponds with the temperature of 6.2 in the same table. Consequently, the species of Scotland is deemed to ascend into an inferior or colder climate than the species of Wales,



although not ascending to the same absolute elevation. Equality of temperature would have been found if the one species had ascended 40 yards higher in Wales, or if the other species had ascended 40 yards less high in Scotland. Climato-botanical investigations admit of being facilitated in various other modes through the adoption of an intermediate standard of temperature, into which elevation and latitude can both be resolved. Through this thermometrical representation, those two potent influences on vegetation can be indirectly brought into comparison, and measured against each other; although in a direct manner they are non-comparable. In applying the two tables to phyto-geographical purposes, the intervening altitudes and temperatures can easily be reckoned. Two yards of ascent, or two minutes of latitude, are assumed to correspond with one-hundredth (0.01) of a degree of temperature. Conversely, the tenth of a degree of temperature (0.1) will correspond with twenty yards of ascent, or with twenty minutes of a degree in latitude.

14. *Temperature of the Seasons.*—The mean temperature for the whole year is now sufficiently understood to be an imperfect measure of climatal influence on the flora and vegetation of a country. In the usual manner of arriving at a mean, low temperatures become reckoned in reduction from the high temperatures; although in fact the former do not reduce the influence of the latter on plants in a corresponding degree. On comparing two climates, for the one of which the summer and winter temperatures are respectively 60 and 20, while for the other they are respectively 50 and 30, the same mean of 40 would probably be obtained for the whole year. But those climates would be adapted to different floras. The

summer heat of the more equal climate would prove inadequate to develop and mature some plants, such as would flourish under the less equal or "excessive" climate, because requiring higher warmth and bearing greater cold. On the contrary, the cooler summer of the more equal climate might still be sufficient for other species, which would be destroyed by the greater intensity of cold in the excessive climate. Numerous facts have been observed which bear out this hypothetical case; here given only for the sake of showing the distinction, and not as being in itself a literal fact. Hence it becomes important to phyto-geographers, to ascertain the difference of temperature according to season. It is to be remarked, however, that even in thus taking the temperatures of the seasons separately, the tendency to a reduction of the higher temperatures, by averaging them with the lower temperatures, is only abated without being fully removed. An inland locality, warmer by day and cooler by night, might have the same summer mean as another locality on the coast, with the day and night temperatures more equal. The former might in consequence be adapted to mature plants, for which the less warm days of the latter would be insufficient. Perhaps eventually the best comparisons may be made for purposes of phyto-geography, by ascertaining the average number of days on which the thermometer indicates given degrees of temperature; for instance, above 50, 60, 70, 80, and intermediate numbers. These would be good data towards comparing the climatal force (so to express it) of different places, or of different years at the same place. At present such data are not attainable, unless imperfectly, and at a sacrifice of time greater than can be devoted thereto. So that, the usual manner must here

be resorted to, by deducing from the means of extremes or from observations made at fixed hours.

Dividing the year into seasons of three months each, and regarding December, January, and February as the three winter months, comparisons may be instituted between the means for the seasons and that for the whole year at the same place, or the seasons at different places may be compared together. In making such comparisons for places in Britain, it will usually be found that the mean for the three autumnal months comes nearest to the mean for the whole year; the difference in several recorded instances being less than a single degree on Fahrenheit's scale. In very few instances are the means for autumn so much as two degrees higher; and perhaps in no correct record are they a full degree under. This near approach to equality seems to hold true alike, whether the mean is deduced from the daily extremes or from registers at stated hours. — The mean for the three spring months is everywhere somewhat lower than that for the whole year; usually between one and two degrees lower; seldom slightly more than two degrees. — The mean for the three winter months is frequently about ten degrees lower than that for the whole year; this difference rising to eleven or twelve degrees for some places in the south-eastern provinces of England, and sinking to nine or even less on the south-western coasts. — The mean for the three summer months, through great part of the island, may be regarded as about ten degrees higher than that for the whole year; the difference increasing to eleven or twelve degrees in the south-eastern provinces, and decreasing to eight degrees or thereabouts in the extreme south-west, as at Penzance, in Cornwall.

Leaving out of view the months of spring and autumn, and making a direct comparison between those of summer



and winter, the mean difference for sixteen places in South Britain (excluding Cornwall) is very slightly under 23 degrees;—that deduced from the registers for twenty places in Mid Britain amounts to 20.20 degrees;—for nine places in the East Highlands it is 21.26 degrees;—for the North Isles and north coast of Scotland it becomes 15, on the average of four places. At Penzance, near the extremity of the Peninsula province, the difference between the summer and winter means is represented to be only 16.18 (16.68 ?); and for four other places in Cornwall it is 17. At Plymouth, in the same province, it is still only 16, on the means from the hourly observations during 5 years. It would appear by these various figures, that through the greater part of Britain, subject of course to deviations from local conditions, the difference between the mean temperatures of summer and winter is from 20 to 21 degrees of Fahrenheit's scale. Further, it may be said that the difference is increased to 23 degrees in the south and south-east of England, where it is greatest; and decreased also to 16 or 17 degrees in the extreme south-west, where it is slightest; possibly with an exception for the North Isles, at only 15. Measured by the centigrade scale, this may be called a difference of  $11\frac{1}{2}$  degrees for Britain generally; rising to about 13 degrees in the south-east of England; and sinking to 9 degrees for the extreme south-west. It has been also stated below 8 degrees for Unst, in Shetland, a very insular position at the extreme north of Britain.

How closely these differences will correspond with those of places at considerable altitudes, it is not yet possible to determine. From the registers at Lead-hills, in South Scotland, at an altitude of 1280 feet, it would seem that the difference between the summer and winter means there nearly equals what has been noted in the

south-east of England ; thus being in excess over the average difference for places little above the sea level in Mid Britain. Some circumstances suggest that the summer temperature of the Highland mountains is higher than might be expected, if compared with that of low places in their vicinity ; but no proper means or averages can here be stated. A remarkable fact, some time ago noted by the writer of this work, seems worthy of record by way of illustration, even though a solitary one. Very near the summit of Ben Alder, near Loch Erricht, in Westerness, is a shallow pool of water, on a bed of dark rock, say (from recollection) a quarter to half an acre in extent, and at an altitude of about 3500 feet. On July 24, 1841, the temperature of this pool was tried by a Fahrenheit thermometer, in the middle of a clear and calm day, and found to be 59. At this time, the cold water from a large patch of snow, melting under the bright sun, was trickling into the pool at one end. The temperature of the long and deep Loch Erricht, at an altitude of 1200 feet, a few hours later on the same day, was found to be only 48. The high temperature of small sphagnous swamps is often quite sensible to the hand, on sunny days, at a considerable elevation. These and other analogous facts show that the heating power of the sun's rays is very great on the higher mountains during serene days. But so many days there are neither calm nor clear, that such a temperature as 59, above recorded for the pool on Ben Alder, may be only a rare and exceptional instance.

15. *Extremes of Temperature.*—Every observer of such matters is familiar with the fact, that most of the plants kept in greenhouses during winter, and removed to the open ground of the gardens during summer, are suc-

cessively killed off by the increasing severity of the frosts of autumn or winter, if left out unsheltered. And during winters of unusual severity even some of the native species are injured or quite killed by very low temperatures. It is less easy to trace any similarly destructive influence from unusually high temperatures; because these being almost constantly accompanied by excessive dryness, the results may be attributed to either or both conditions. But the well-known fact of extreme temperatures being fatal to plants, either directly or indirectly, shows the importance of ascertaining the ordinary and extraordinary extremes which are experienced in any country or locality under consideration botanically.

According to Luke Howard's registers for the ten years following 1806, in the neighbourhood of London, the extremes observed by him were 96 and  $-5$ , respectively in 1808 and 1816; thus giving a total range of 101 degrees. Howard alludes also to a temperature of  $-6.5$ , noted by another observer in 1796; thus adding one degree and a half to the full range observed by himself. During the twenty years following 1837, at Thames Ditton, a dozen miles south from London, the observed extremes were 90 and  $-8$ , respectively in 1846 and 1838; the greater cold and lesser heat, than those noted by Howard, thus giving together the reduced range of 98 only. Combining the highest temperature recorded by Howard, with the lowest observed at Thames Ditton, the extreme range is raised to 104. As recorded by the same Author, in his volumes on 'The Climate of London,' the extreme temperatures during each of the ten successive years were these:—

Max. 87, 96, 82, 85, 88, 78, 85, 91, 80, 81.

Min. 13, 12, 18, 10, 14, 18, 19, 8, 17,  $-5$ .

Thus, a temperature below zero of Fahrenheit occurred



only once in the series of ten years. The widest range or variation during the same single year was 86 in 1816, and 84 in 1808; the two years respectively distinguished by the lowest and highest temperatures. In 1814, the high and low temperatures of 91 and 8 were noted; giving a range of 83 for the same year. According to the registers at Thames Ditton, from 1838 to 1857, the thermometer of Fahrenheit was only twice observed below zero during the series of twenty years; namely at  $-8$  in the night of January 19, 1838, and at  $-2$  in the morning of February 12, 1845. In other two of the years it was noted at 8 above zero, and in two others at 10 above zero. During some of the years it fell only to about 20; and in one of them it was not registered below 27. The highest temperatures at the same place, during the same twenty years, were much more uniform, varying only from 80 to 90. Only once was the latter high figure attained; and in three of the years that of 80 was the highest for each year. In the other sixteen years the variations were from 82 to 89.

Temperatures below zero occur in other parts of Britain; but perhaps nowhere below those occasionally experienced in the south-eastern provinces, unless at considerable elevations. Thus, the night between January 19 and 20, in the year 1838, was remarkable for very low temperatures in many places. The subjoined records in relation thereto were collected by Mr. Wilson Armistead, and printed in Hall's *Flora of Liverpool* :—

Sheffield, South-west Yorkshire,	$-5$ degrees.
Chiswick, Middlesex,	$-4$
Hampstead Heath, Middlesex,	$-4$
Greenwich, West Kent,	1
Leicester, Leicestershire,	2
York. (Vice-County ?)	3

Edge Hill, near Liverpool,	4
Kensington, near London,	4
Clapham, near London,	5
Chester, Cheshire,	6
Crayford, West Kent,	6
Leeds, Mid-west Yorkshire,	8
Birmingham, Warwickshire,	9
Malvern, Worcestershire,	9
Bedford, Bedfordshire,	10
Woodside, Cheshire,	11
Liverpool, South Lancashire,	11
London (Royal Society),	11
Newcastle, Northumberland,	12
Kendal, Westmoreland,	16
Swansea, Glamorgan,	17
Bickston, South Devon,	18
Penzance, West Cornwall,	30

The lowest temperatures on this occasion were not simultaneous everywhere. A change had already commenced in the south-west of England before the coldest day elsewhere. At Penzance, the temperatures of 23, 30, 37 are dated January 18, 19, 20. At Swansea, the temperatures of 17 and 18 are given for January 19 and 20. At Kendal, the same lowest temperature of 16 is reported for three successive days, January 19, 20, 21. At Thames Ditton, the thermometer rose gradually from its lowest observed point of  $-8$ , on the night of January 19, till it attained to 46 by mid-day of January 22; again falling back to the freezing point in the succeeding night. The comparatively high temperature recorded for Kendal, on this memorable date, is not to be received as any evidence that very low temperatures are not occasionally experienced in the Lake province. For example, it appears by Mr. Wilson Pitt's register kept at Carlisle, in

the same province, for the years between 1800 and 1825, that the extreme temperatures observed by him were 85 and  $-2$ ; the registers being made at the hours 8, 1, 10. Similar local variations occur also elsewhere at corresponding dates. Thus, Professor Dickie mentions a temperature of  $-1$  at Aberdeen on February 15, 1855. At Thames Ditton, the lowest temperatures of the same month in that year occurred some days before and after the 15th. In the early mornings of the 11th and 19th the thermometer was down to 8 degrees above zero, the lowest points reached; and in the mornings of the 18th and 20th it stood at 10. It was not so low at Thames Ditton between the dates mentioned; and there the lowest points of the month were 9 degrees above the lowest at Aberdeen. Greater depressions of the thermometer probably occur in places much elevated above the sea. At Lead-hills in South Scotland, at 1280 feet of altitude, the observed extremes were 79 and  $-16$ , during the ten years following 1810.

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N.B. SUMMARY OF DISTRIBUTION, page 175.—The letters and figures used as abbreviations will be found explained after the end of the list. The like course will be taken with the succeeding lists also.



## V. SUMMARY OF DISTRIBUTION.

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### 1. *Ranunculaceæ*. Species 35. Census 1654. (*Dubious* 6—137).

CLEMATIS	(Long.	Lat.	Alt.	Zones.	Cen.	Type).
Vitalba	i w e	s ? -	c - -	1 ? - - - -	41	E. g.
THALICTRUM						
alpinum	i w e	s m n	c a u	- - 3 4 5 6	23	H.
minus	i w e	s m n	c a -	1 2 3 4 ? -	49	S. b.
majus	i w e	- m n	c a -	- 2 3 - - -	10	I.
flavum	i w e	s m n	c - -	1 2 - - - -	49	E.
ANEMONE						
nemorosa	i w e	s m n	c a u	1 2 3 4 5 -	85	B.
Pulsatilla	- w e	s m -	c - -	1 2 - - - -	15	G.
ADONIS						
autumnalis	- w e	s - -	c - -	1 - - - - -	11	G.
MYOSURUS						
minimus	- w e	s m -	c - -	1 2 - - - -	35	G. e.
RANUNCULUS						
aquatilis	i w e	s m n	c a -	1 2 3 - - -	86	B.
circinatus	i w e	s m -	c - -	1 2 - - - -	27	E. g.
fluitans	i w e	s m -	c - -	1 2 - - - -	27	E.
tripartitus	- w e	s - -	c - -	1 - - - - -	4	E.
cœnosus	i w e	s m -	c a -	1 2 3 - - -	25	E. a.
hederaceus	i w e	s m n	c a u	1 2 3 4 - -	80	B.
Ficaria	i w e	s m n	c a u	1 2 3 4 - -	82	B.
Flammula	i w e	s m n	c a u	1 2 3 4 5 -	99	B.
Lingua	i w e	s m n	c a -	1 2 3 - - -	56	E. b.
auricomus	i w e	s m n	c a -	1 2 3 - - -	65	B. e.
acris	i w e	s m n	c a u	1 2 3 4 5 6	98	B.
repens	i w e	s m n	c a u	1 2 3 4 5 -	97	B.

## RANUNCULUS

bulbosus	i w e	s m n	c a -	1 2 3 - - -	80	B. e.
hirsutus	i w e	s m n	c - -	1 2 - - - -	57	E. b.
sceleratus	i w e	s m n	c - -	1 2 3 - - -	82	B.
parviflorus	i w e	s m -	c - -	1 2 - - - -	47	E.
arvensis	i w e	s m -	c - -	1 2 - - - -	56	E.

## CALTHA

palustris	i w e	s m n	c a u	1 2 3 4 5 6	93	B.
radicans	- - e	- - n	c a -	- 2 3 - - -	2	S.

## TROLLIUS

europæus	i w e	s m n	c a u	- 2 3 4 5 -	49	S.
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## HELLEBORUS

viridis	i w e	s m -	c a -	1 2 - - - -	30	G. e.
fœtidus	- w e	s m -	c a -	1 2 - - - -	29	G. e.

## AQUILEGIA

vulgaris	i w e	s m -	c a -	1 2 - - - -	51	E. i.
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## DELPHINIUM

Consolida?	- - e	s - -	c - -	1 - - - - -	5	G.
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## ACONITUM

Napellus	- w -	s - -	c - -	1 - - - - -	6	D. a.
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## ACTÆA

spicata	- w e	- m -	c a -	- 2 3 - - -	3	I.
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1\*. *Berberaceæ*. Species 1. Census 30. (*Dubious* 1—30).

## BERBERIS

vulgaris	i w e	s m ?	c - -	1 2 - - - -	30	E.
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2. *Nymphaeaceæ*. Species 3. Census 131.

## NYMPHÆA

alba	i w e	s m n	c a -	1 2 3 - - -	61	B.
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## NUPHAR

lutea	i w e	s m n	c a -	1 2 3 - - -	65	E. b.
pumila	- w e	- ? n	c a -	- - 3 - - -	5	S.

3. *Papaveraceæ*. Species 7. Census 376. (*Dubious* 5—319).

## PAPAVER

hybridum	i w e	s m -	c - -	1 2 - - - -	30	E.
Argemone	i w e	s m n	c - -	1 2 3 - - -	70	B. e.
dubium	i w e	s m n	c a -	1 2 3 - - -	85	B.
Rhœas	i w e	s m n	c a -	1 2 3 - - -	72	B. e.

## MECONOPSIS

cambrica	i w e	s m -	c a -	1 2 3 4 - -	16	A.
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## CHELIDONIUM

majus	i w e	s m ?	c a -	1 2 - - -	62	E. b.
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## GLAUCIUM

luteum	i w e	s m n	c - -	1 2 - - -	41	E.
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3\*. *Fumariaceæ*. Species 6. Census 258. (*Dubious* 5—198).

## CORYDALIS

claviculata	i w e	s m n	c a -	1 2 3 - - -	60	B. a.
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## FUMARIA

capreolata	i w e	s m n	c - -	1 2 3 - - -	77	B.
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officinalis	i w e	s m n	c a -	1 2 3 - - -	85	B.
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micrantha	- w e	s m n	c - -	1 2 3 - - -	20	E. g.
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parviflora	? - e	s m -	c - -	1 2 - - - -	9	G.
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Vaillantii	? - e	s - -	c - -	1 2 - - - -	7	G.
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4. *Cruciferaæ*. Species 60. Census 2156. (*Dubious* 13—336).

## CAKILE

maritima	i w e	s m n	c - -	1 2 3 - - -	48	B.
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## CRAMBE

maritima	i w e	s m n	c - -	1 2 - - - -	28	E.
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## CORONOPUS

didyma	i w e	s - -	c - -	1 - - - - -	12	A.
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Ruellii	i w e	s m n	c - -	1 2 3 - - -	67	E. b.
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## THLASPI

arvense	i w e	s m n	c - -	1 2 3 - - -	53	B. e.
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perfoliatum	- w e	s - -	c a -	1 ? - - - -	2	E.
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alpestre	- w e	s m n	c a u	- 2 3 4 5 -	10	I.
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## CAPSELLA

Bursa	i w e	s m n	c a -	1 2 3 - - -	92	B.
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## HUTCHINSIA

petræa	- w e	s m -	c a -	1 2 3 - - -	11	I. a.
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## TEESDALIA

nudicaulis	- w e	s m n	c a -	1 2 3 - - -	47	E. b.
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## IBERIS

amara	- - e	s - -	c - -	1 - - - - -	8	G.
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## LEPIDIUM

latifolium	i w e	s m -	c - -	1 2 - - - -	9	E. g.
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Smithii	i w e	s m n	c a -	1 2 3 - - -	56	B. e.
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campestre	i w e	s m n	c - -	1 2 3 - - -	60	B. e.
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ruderales	i w e	s - -	c - -	1 - - - - -	16	E.
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## COCHLEARIA

officinalis	i w e	s m n	c a u	1 2 3 4 5 6	55	B.
danica	i w e	s m n	c - -	1 2 3 - - -	32	B.
anglica	i w e	s m -	c - -	1 2 3 - - -	24	E.

## SUBULARIA

aquatica	i w e	s m n	c a -	- 2 3 4 5 -	13	S.
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## DRABA

aizoides	- w -	s - -	c - -	1 - - - - -	1	L. a.
rupestris	- w e	- - n	- - u	- - - - - 6	4	H. l.
incana	i w e	- m n	c a u	- - 3 4 5 6	17	H.
muralis	i w e	s m -	c a -	- 2 3 - - -	6	I.
verna	i w e	s m n	c a u	1 2 3 4 5 -	81	B.

## DENTARIA

bulbifera	- w e	s m -	c - -	1 2 - - - -	7	G. e.
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## CARDAMINE

amara	i w e	s m n	c a -	1 2 3 - - -	58	B. g.
pratensis	i w e	s m n	c a u	1 2 3 4 5 6	88	B.
hirsuta	i w e	s m n	c a ?	1 2 3 - - -	77	B.
sylvatica	i w e	s m n	c a ?	1 2 3 4 5 -	50	B. ?
impatiens	- w e	s m -	c a -	1 2 - - - -	13	I.

## ARABIS

thaliana	i w e	s m n	c a -	1 2 3 - - -	65	B. e.
petræa	i w e	- m n	- a u	- - 3 4 5 6	10	H.
stricta	- w -	s - -	c - -	1 - - - - -	2	L. a.
hirsuta	i w e	s m n	c a u	1 2 3 4 5 -	68	B. e.
ciliata	i w -	s - -	? - -	? - - - - -	1	L. a.

## TURRITIS

glabra	- w e	s m n	c - -	1 2 - - - -	31	G. e.
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## BARBAREA

vulgaris	i w e	s m n	c - -	1 2 3 - - -	73	B. e.
arcuata	- w e	s m -	c - -	1 2 - - - -	5	E. l.
stricta	- w e	s m -	c - -	1 2 - - - -	5	E. l.

## NASTURTIUM

officinale	i w e	s m n	c a -	1 2 3 - - -	85	B.
terrestre	i w e	s m n	c - -	1 2 3 - - -	56	E. b.
sylvestre	i w e	s m n	c - -	1 2 - - - -	44	E.
amphibium	i w e	s m -	c - -	1 2 - - - -	33	E.

## SISYMBRIUM

officinale	i w e	s m n	c a -	1 2 3 - - -	88	B.
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## SISYMBRIUM

Irio	i w e	s m -	c - -	1 2 - - - -	7	E.
Sophia	i w e	s m n	c - -	1 2 3 - - -	51	E. b.

## ERYSIMUM

cheiranthoides	i w e	s - -	c - -	1 - - - - -	27	E.
Alliaria	i w e	s m n	c a -	1 2 3 - - -	79	B. e.

## MATTHIOLA

incana	- - e	s - -	c - -	1 - - - - -	1	E.
sinuata	i w -	s - -	c - -	1 - - - - -	7	A.

## BRASSICA

oleracea	i w ?	s ? ?	c - -	1 - - - - -	11	A.
campestris	i w e	s m -	c a -	1 2 - - - -	30	E. ?

## SINAPIS

arvensis	i w e	s m n	c a -	1 2 3 - - -	90	B.
alba	i w e	s m n	c - -	1 2 3 - - -	40	E. b.
nigra	i w e	s m -	c - -	1 2 - - - -	40	E.
tenuifolia	i w e	s m n	c - -	1 2 - - - -	35	E.
muralis	i w e	s m -	c - -	1 - - - - -	15	E.
monensis	- w -	s m n	c - -	1 2 - - - -	16	A.

## RAPHANUS

Raphanistrum	i w e	s m n	c a -	1 2 3 - - -	81	B.
maritimus	i w e	s m n	c - -	1 2 - - - -	15	A.

5. *Resedaceæ*. Species 2. Census 131.

## RESEDA

luteola	i w e	s m n	c - -	1 2 3 - - -	79	B. e.
lutea	i w e	s m n	c - -	1 2 - - - -	52	E. g.

6. *Cistaceæ*. Species 4. Census 79.

## HELIANTHEMUM

vulgare	? w e	s m n	c a -	1 2 3 4 - -	69	B. e.
polifolium	- w -	s - -	c - -	1 - - - - -	2	A.
canum	i w e	s m -	c a -	1 2 3 - - -	7	I. a.
Breweri	- w -	s - -	c - -	1 - - - - -	1	I. a.

7. *Violaceæ*. Species 10. Census 446.

## VIOLA

palustris	i w e	s m n	c a u	1 2 3 4 5 6	62	B.
odorata	i w e	s m -	c - -	1 2 - - - -	50	E.
hirta	i w e	s m n	c a -	1 2 - - - -	58	E.
sylvatica	i w e	s m n	c a u	1 2 3 4 5 -	87	B.
flavicornis	i w e	s m n	c a -	1 2 3 - - -	44	B. e.

## VIOLA

lactea	i w e	s - -	c - -	1 - - - - -	3	E.
stagnina	i w e	s - -	c - -	1 - - - - -	4	E.
tricolor	i w e	s m n	c a -	1 2 3 - - -	84	B.
lutea	i w e	s m n	c a u	? 2 3 4 5 -	50	S.
Curtisii	? w -	s ? -	c - -	1 - - - - -	4	A.

8. *Droseraceæ*. Species 3. Census 154.

## DROSERA

rotundifolia	i w e	s m n	c a -	1 2 3 4 - -	80	B.
intermedia	i w e	s m n	c - -	1 2 3 - - -	41	E.
anglica	i w e	s m n	c a -	1 2 3 4 - -	33	S.

9. *Polygalaceæ*. Species 3. Census 98.

## POLYGALA

vulgaris	i w e	s m n	c a u	1 2 3 4 5 -	91	B.
calcareæ	- w e	s - -	c - -	1 - - - - -	6	E. g.
uliginosa	- - e	- m -	- a  -	- - 3 - - -	1	I.

10. *Frankeniaceæ*. Species 1. Census 11.

## FRANKENIA

lævis	- - e	s - -	c - -	1 - - - - -	11	G.
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11. *Elatinaceæ*. Species 2. Census 16.

## ELATINE

hexandra	? w e	s m n	c - -	1 2 3 - - -	13	E.
Hydropiper	i w e	s - -	c - -	1 - - - - -	3	E.

12. *Caryophyllaceæ*. Species 57. Census 2338. (*Dubious* 5—185).

## DIANTHUS

prolifer	- - e	s - -	c - -	1 - - - - -	4	G.
Armeria	- w e	s m n	c - -	1 2 - - - -	30	E.
cæsius	- w -	s - -	c - -	1 - - - - -	1	L. a.
deltoides	i w e	s m n	c ? -	1 2 3 - - -	35	E. i.

## SAPONARIA

officinalis	i w e	s m n	c - -	1 2 - - - -	50	E.
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## SILENE

inflata	i w e	s m n	c a -	1 2 3 - - -	78	B. e.
maritima	i w e	s m n	c a u	1 2 3 4 5 6	56	B.
Otites	- - e	s - -	c - -	1 - - - - -	3	G.
anglica	i w e	s m n	c - -	1 2 3 - - -	44	E.
nutans	- w e	s m n	c - -	1 2 - - - -	15	E. g.
italica	- - e	s - -	c - -	1 - - - - -	1	G.
noctiflora	- w e	s m n	c - -	1 2 - - - -	27	E.



## SILENE

conica	? - e	s m n	c - -	1 2 - - -	5	E.
acaulis	i w e	s m n	- a u	- - - 4 5 6	18	H.

## LYCHNIS

alpina	- w e	- m n	- ? u	- - - - 5 -	2	H.
Viscaria	- w e	s m n	c a -	- 2 3 - - -	9	S. i.
Flos-cuculi	i w e	s m n	c a -	1 2 3 4 - -	89	B.
diurna	i w e	s m n	c a u	1 2 3 4 5 -	89	B.
vespertina	i w e	s m n	c a -	1 2 3 - - -	65	B. e.
Githago	i w e	s m n	c - -	1 2 3 - - -	77	B.

## MÖENCHIA

erecta	- w e	s m -	c a -	1 2 3 - - -	35	E.
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## SAGINA

procumbens	i w e	s m n	c a u	1 2 3 4 5 6	89	B.
maritima	i w e	s m n	c - -	1 2 3 - - -	43	B.
apetala	i w e	s m n	c a -	1 2 - - - -	53	E. b.
ciliata	i w e	s m -	c - -	1 2 - - - -	8	E. ?
saxatilis	? w e	- - n	- a u	- - - 4 5 6	5	H.
subulata	i w e	s m n	c a -	1 2 3 4 5 -	35	S. b.
nodosa	i w e	s m n	c a -	1 2 3 - - -	72	B.

## SPERGULA

arvensis	i w e	s m n	c a -	1 2 3 - - -	90	B.
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## HONKENEJA

peploides	i w e	s m n	c - -	1 2 3 - - -	53	B.
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## SPERGULARIA

marina	i w e	s m n	c - -	1 2 3 - - -	54	B.
rubra	i w e	s m n	c - -	1 2 3 - - -	69	B.

## ARENARIA

norvegica	- w -	- - n	c - -	- - - 4 - -	1	S.
serpyllifolia	i w e	s m n	c a -	1 2 3 - - -	84	B.
tenuifolia	- w e	s m -	c a -	1 2 3 - - -	21	E.
verna	i w e	s m n	c a u	1 2 3 4 5 -	25	I. s.
rubella	- w e	- - n	- - u	- - - - 5 6	2	H.
uliginosa	- - e	- m -	- a -	- - 3 - - -	1	L. i.
trinervis	i w e	s m n	c ? -	1 2 3 - - -	74	B. e.

## HOLOSTEUM

umbellatum	- - e	s - -	c - -	1 - - - - -	2	G.
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## STELLARIA

nemorum	i w e	s m n	c a -	1 2 3 - - -	33	S. i.
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## STELLARIA

media	i w e	s m n	c a u	1 2 3 4 5 -	95	B.
holostea	i w e	s m n	c a -	1 2 3 4 - -	83	B.
glauca	i w e	s m n	c - -	1 2 - - - -	43	E. b.
graminea	i w e	s m n	c a -	1 2 3 - - -	90	B.
uliginosa	i w e	s m n	c a u	1 2 3 4 5 6	78	B.
cerastoides	i w e	- - n	- - u	- - - - - 6	4	H.

## CERASTIUM

aquaticum	i w e	s m -	c - -	1 2 - - - -	46	E.
glomeratum	i w e	s m n	c a -	1 2 3 - - -	87	B.
triviale	i w e	s m n	c a u	1 2 3 4 5 6	96	B.
semidecandrum	i w e	s m n	c - -	1 2 3 - - -	62	B. e.
tetrandrum	i w e	s m n	c - -	1 2 3 - - -	43	B.
arvense	i w e	s m n	c a -	1 2 3 - - -	40	B. e.
alpinum	- w e	- m n	- - u	- - - - 5 6	9	H.
latifolium	- w e	- m n	- - u	- - - - 5 6	8	H.
nigrescens	- w -	- - n	c - -	- - - 4 - -	1	S.

## CHERLERIA

sedoides	- w e	- - n	- - u	- - - - 5 6	6	H.
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*Linaceæ. Species 4. Census 188.*

## LINUM

perenne	i ? e	s m -	c a -	1 2 - - - -	11	G. i.
angustifolium	i w e	s m -	c - -	1 2 - - - -	21	A.
catharticum	i w e	s m n	c a u	1 2 3 4 5 -	94	B.

## RADIOLA

millegrana	i w e	s m n	c - -	1 2 3 - - -	62	B.
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14. *Mulvaceæ. Species 5. Census 245.*

## MALVA

moschata	i w e	s m n	c a -	1 2 - - - -	76	B. e.
sylvestris	i w e	s m n	c a -	1 2 3 - - -	76	B. e.
rotundifolia	i w e	s m n	c ? -	1 2 3 - - -	65	E. b.

## ALTHÆA

officinalis	i w e	s m ?	c - -	1 2 - - - -	18	E.
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## LAVATERA

arborea	i w -	s m -	c - -	1 2 - - - -	10	A.
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15. *Tiliaceæ. Species 1. Census 19. (Dubious 1—19).*

## TILIA

parvifolia	i w e	s m -	c - -	1 2 - - - -	19	E.
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16. *Hypericaceæ*. Species 10. Census 592.

## HYPERICUM

Androsæmum	i w e	s m n	c - -	1 2 3 - - -	60	E. b.
perforatum	i w e	s m n	c a -	1 2 3 - - -	79	B.
dubium	i w e	s m n	c a -	1 2 3 - - -	53	E. b.
quadrangulum	i w e	s m n	c a -	1 2 3 - - -	82	B. e.
humifusum	i w e	s m n	c a -	1 2 3 - - -	75	B. e.
linariifolium	- w -	s - -	c - -	1 - - - -	2	A.
pulehrum	i w e	s m n	c a u	1 2 3 4 - -	91	B.
hirsutum	i w e	s m n	c a -	1 2 3 - - -	68	B. e.
montanum	- w e	s m -	c a -	1 2 - - - -	34	E.
elodes	i w e	s m -	c a -	1 2 3 - - -	48	E. a.

17. *Aceraceæ*. Species 1. Census 50.

## ACER

campestre	i w e	s m ?	c a -	1 2 - - - -	50	E.
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18. *Geraniaceæ*. Species 14. Census 758. (*Dubious* 1—28)

## ERODIUM

maritimum	i w e	s m -	c - -	1 2 - - - -	29	A. e.
cicutarium	i w e	s m n	c a -	1 2 3 - - -	82	B.
moschatum	i w -	s - -	c - -	1 - - - - -	8	A.

## GERANIUM

sylvaticum	i w e	s m n	c a u	1 2 3 4 5 -	37	S. i.
pratense	i w e	s m n	c a -	1 2 3 4 - -	68	B. e.
pyrenaicum	i w e	s m -	c - -	1 2 - - - -	28	E.
rotundifolium	i w e	s - -	c - -	1 - - - - -	15	E.
pusillum	i w e	s m n	c - -	1 2 3 - - -	52	E. b.
molle	i w e	s m n	c a -	1 2 3 - - -	92	B.
dissectum	i w e	s m n	c a -	1 2 3 - - -	86	B.
columbinum	i w e	s m n	c a -	1 2 - - - -	52	E. b.
lucidum	i w e	s m n	c a -	1 2 3 - - -	69	B. e.
robertianum	i w e	s m n	c a -	1 2 3 - - -	94	B.
sanguineum	i w e	s m n	c a -	1 2 3 - - -	46	B. i.

19. *Balsaminaceæ*. Species 1. Census 6. (*Dubious* 1—6).

## IMPATIENS

Noli-tangere	- w -	s m -	c - -	- 2 - - - -	6	L. a.
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20. *Oxalidaceæ*. Species 1. Census 84.

## OXALIS

Acetosella	i w e	s m n	c a u	1 2 3 4 5 6	84	B.
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21. *Celastraceæ*. Species 1. Census 62.

## EUONYMUS

europæus	i w e	s m -	c a -	1 2 - - -	62	E.
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22. *Rhamnaceæ*. Species 2. Census 92.

## RHAMNUS

catharticus	i w e	s m -	c a -	1 2 - - -	46	E.
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Frangula	i w e	s m -	c - -	1 2 - - -	46	E.
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23. *Leguminiferaæ*. Species 70. Census 2850. (*Dubious* 8—116).

## SPARTIUM

scoparium	i w e	s m n	c a -	1 2 3 4 - -	87	B.
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## ULEX

europæus	i w e	s m n	c a -	1 2 3 - - -	94	B.
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nanus	i w e	s m -	c a -	1 2 - - -	49	E.
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## GENISTA

tinctoria	i w e	s m -	c a -	1 2 - - -	57	E.
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pilosa	- w e	s - -	c - -	1 - - - -	4	E.
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anglica	- w e	s m n	c a -	1 2 3 4 - -	72	B. e.
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## ONONIS

arvensis	i w e	s m n	c a -	1 2 3 - - -	80	B.
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spinosa	i w e	s m n	c - -	1 2 - - -	47	B. e.
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## ANTHYLLIS

vulneraria	i w e	s m n	c a u	1 2 3 4 5 -	80	B.
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## MEDICAGO

sylvestris	- ? e	s ? -	c - -	1 - - - -	3	G.
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falcata	i - e	s - -	c - -	1 - - - -	4	G.
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lupulina	i w e	s m n	c a -	1 2 3 - - -	82	B.
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maculata	i w e	s m -	c - -	1 2 - - -	30	E.
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denticulata	i w e	s m -	c - -	1 - - - -	13	E.
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minima	- - e	s - -	c - -	1 - - - -	5.	G.
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## MELILOTUS

officinalis	i w e	s m -	c - -	1 2 - - -	52	E.
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arvensis	i w e	s m -	c - -	1 - - - -	8	G. e.
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vulgaris	i w e	s m -	c - -	1 2 - - -	13	E.
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## TRIFOLIUM

ornithopodioides	i w e	s m n	c - -	1 2 - - -	22	E.
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repens	i w e	s m n	c a u	1 2 3 4 5 -	97	B.
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subterraneum	- w e	s m -	c - -	1 - - - -	27	E.
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ochroleucum	- ? e	s - -	c - -	1 - - - -	10	G.
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Molinieri	- w -	s - -	c - -	1 - - - -	1	A.
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## TRIFOLIUM

pratense	i w e	s m n	c a u	1 2 3 4 5 -	95	B.
medium	i w e	s m n	c a -	1 2 3 - - -	73	B.
maritimum	i w e	s - -	c - -	1 - - - - -	9	E.
arvense	i w e	s m n	c - -	1 2 3 - - -	74	B. e.
scabrum	i w e	s m n	c - -	1 2 - - - -	49	E.
striatum	i w e	s m n	c a -	1 2 3 - - -	45	E.
Bocconi	- w -	s - -	c - -	1 - - - - -	1	A.
glomeratum	- w e	s - -	c - -	1 - - - - -	10	E.
strictum	- w -	s - -	c - -	1 - - - - -	2	A.
suffocatum	- w e	s - -	c - -	1 - - - - -	10	E.
fragiferum	i w e	s m n	c - -	1 2 - - - -	54	E.
procumbens	i w e	s m n	c a -	1 2 3 - - -	84	B.
minus?	i w e	s m n	c a -	1 2 3 - - -	54	E. b.
filiforme?	i w e	s m n	c - -	1 2 3 - - -	69	B. e.

## LOTUS

corniculatus	i w e	s m n	c a u	1 2 3 4 5 -	94	B.
major	i w e	s m n	c a -	1 2 3 - - -	82	B. e.
angustissimus	? w e	s - -	c - -	1 - - - - -	5	E. a.
hispidus	- w -	s - -	c - -	1 - - - - -	4	A.

## ASTRAGALUS

glycyphyllos	- w e	s m n	c - -	1 2 3 - - -	51	G. b.
hypoglottis	i w e	s m n	c - -	1 2 3 - - -	28	G. b.
alpinus	- - e	- - n	- - u	- - - - 5 -	2	H.

## OXYTROPIS

uralensis	- w e	- m n	c ? -	- 2 3 - - -	6	S.
campestris	- - e	- - n	- a -	- - - - 5 -	1	H.

## ORNITHOPUS

perpusillus	i w e	s m n	c - -	1 2 3 - - -	68	B. e.
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## ARTHROLOBIUM

ebracteatum	- w -	s - -	c - -	1 - - - - -	1	A.
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## HIPPOCREPIS

comosa	- w e	s m n	c a -	1 2 3 4 - -	32	E. g.
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## ONOBRYCHIS

sativa	- w e	s m -	c - -	1 2 - - - -	28	E. g.
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## VICIA

Orobis	i w e	s m n	c - -	- 2 3 - - -	20	I. a.
sylvatica	i w e	s m n	c a -	1 2 3 - - -	60	B. ?
Cracca	i w e	s m n	c a u	1 2 3 4 5 -	89	B.

## VICIA

angustifolia	i w e	s m n	c - -	1 2 3 - - -	54	B. e.
lathyroides	i w e	s m n	c - -	1 2 3 - - -	41	B. ?
lutea	- w e	s m n	c - -	1 2 - - - -	9	E. ?
sepium	i w e	s m n	c a -	1 2 3 4 - -	88	B.
bithynica	- w e	s m -	c - -	1 2 - - - -	15	E. a.
hirsuta	i w e	s m n	c a -	1 2 3 - - -	79	B.
tetrasperma	i w e	s m n	c - -	1 2 - - - -	61	E. b.
gracilis	i w e	s - -	c - -	1 - - - - -	6	E.

## LATHYRUS

Aphaca	- w e	s - -	c - -	1 - - - - -	22	E. g.
Nissolia	- w e	s m -	c - -	1 - - - - -	32	E. g.
hirsutus	- - e	s - -	c - -	1 - - - - -	1	L. g.
pratensis	i w e	s m n	c a -	1 2 3 - - -	91	B.
palustris	i w e	s m -	c - -	1 2 - - - -	11	E.
sylvestris	- w e	s m n	c - -	1 2 ? - - -	47	E.
maritimus	i w e	s m n	c - -	1 2 3 - - -	7	E. s.

## OROBUS

tuberosus	i w e	s m n	c a -	1 2 3 4 - -	79	B.
niger	- - e	- m n	- ? -	- - 3 - - -	4	S.

24. *Rosaceæ*. Species 82. Census 2714. (*Dubious* 3—91).

## PRUNUS

spinosa	i w e	s m n	c a -	1 2 3 - - -	85	B.
Padus	i w e	s m n	c a -	1 2 3 ? - -	39	S.
Cerasus	- w e	s m -	c - -	1 2 - - - -	17	E.
avium	i w e	s m n	c a -	1 2 3 - - -	58	E. b.

## SPIRÆA

Ulmaria	i w e	s m n	c a u	1 2 3 4 5 -	93	B.
Filipendula	i w e	s m n	c a -	1 2 3 - - -	47	E. g.

## DRYAS

octopetala	i w e	s m n	c a u	- - 3 4 5 -	14	H.
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## GEUM

urbanum	i w e	s m n	c a -	1 2 3 - - -	87	B. e.
rivale	i w e	s m n	c a u	1 2 3 4 5 -	68	B. s.

## SIBBALDIA

procumbens	- w e	- m n	- a u	- - - 4 5 6	14	H.
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## POTENTILLA

fruticosa	i w e	- m -	? a -	- 2 3 4 - -	3	I.
rupestris	- w -	s - -	? a -	- 2 - - - -	1	L.



## POTENTILLA

anserina	i w e	s m n	c a -	1 2 3 - - -	93	B.
argentea	i w e	s m n	c a -	1 2 3 - - -	40	E. g.
verna	- w e	s m n	c a -	1 2 3 - - -	19	I. e.
alpestris	- w e	- m n	- a u	- - 3 4 5 -	9	H.
reptans	i w e	s m n	c a -	1 2 3 - - -	75	E. b.
Tormentilla	i w e	s m n	c a u	1 2 3 4 5 6	92	B.
Fragariastrum	i w e	s m n	c a -	1 2 3 4 - -	75	B. e.

## COMARUM

palustre	i w e	s m n	c a u	1 2 3 4 5 -	77	B. s.
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## FRAGARIA

vesca	i w e	s m n	c a -	1 2 3 4 - -	88	B.
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## RUBUS

Chamæmorus	i w e	s m n	- a u	- - 3 4 5 6	26	H.
saxatilis	i w e	s m n	c a u	- 2 3 4 5 -	43	S. h.
Idæus	i w e	s m n	c a -	1 2 3 4 - -	71	B. s.
suberectus	i w e	? m n	c a -	- 2 3 - - -	22	S.

*Sp. Babingtonianæ.* (The counties, not vice-counties, reckoned here).

fissus	- w -	s - -	c - -	1 - - - -	1	L.
plicatus	i w e	s m n	c - -	1 2 ? - - -	22	E. b.
nitidus	i w e	s m -	c - -	1 2 - - - -	17	E.
affinis	- w e	s m n	c - -	1 2 ? - - -	18	E. b.
latifolius	- - e	- m n	c - -	- 2 ? - - -	3	L.
imbricatus	- w -	s - -	c - -	1 - - - - -	2	L.
incurvatus	- w -	s m -	c - -	1 2 - - - -	5	E.
rhamnifolius	i w e	s m n	c - -	1 2 - - - -	16	E.
Grabowskii	- - e	- m -	c - -	1 - - - - -	1	L.
thyrsoides	i w e	s m -	c - -	1 2 - - - -	12	E.
discolor	i w e	s m -	c - -	1 2 - - - -	20	E.
leucostachys	i w e	s m -	c - -	1 2 - - - -	20	E.
carpinifolius	i w e	s m n	c - -	1 2 3 - - -	22	E. b.
villicaulis	i w e	s m -	c - -	1 2 - - - -	16	E.
pampinosus	- w -	s - -	c - -	1 - - - - -	2	L.
mucronatus	- w e	s m n	c - -	1 2 ? - - -	5	L. e.
Salteri	- w e	s m -	c - -	1 2 - - - -	5	L. e.
macrophyllus	i w e	s m -	c - -	1 2 - - - -	20	E.
Sprengelii	- w e	s m -	c - -	1 2 - - - -	13	E.
Bloxamii	- w e	s - -	c - -	1 - - - - -	2	L.
Hystrix	- w e	s m -	c - -	1 2 - - - -	13	E.

## RUBUS

Radula	- w e	s m -	c - -	1 2 - - - -	15	E.
rudis	i w e	s m -	c - -	1 2 - - - -	19	E.
pallidus	i w e	s m n	c - -	1 2 ? - - -	15	E. b.
Koehleri	i w e	s m -	c - -	1 2 - - - -	15	E.
fusco-ater	- w e	s m -	c - -	1 2 - - - -	13	E.
pyramidalis	- w -	s - -	c - -	1 - - - - -	4	E. a.
Guntheri	- w e	s - -	c - -	1 - - - - -	5	E. a.
hirtus	- w e	s m -	c - -	1 2 - - - -	6	E.
glandulosus	- w e	s m -	c - -	1 2 - - - -	15	E.
scaber	- w e	s m -	c - -	1 - - - - -	5	E.
Balsourianus	- w -	s - -	c - -	1 - - - - -	1	L.
corylifolius	i w e	s m n	c a -	1 2 - - - -	25	E.
nemorosus	i w e	s m -	c - -	1 2 - - - -	14	E.
cæsius	i w e	s m -	c a -	1 2 - - - -	20	E.

## ROSA

spinosissima	i w e	s m n	c a -	1 2 3 4 - -	63	B.
mollis	i w e	s m n	c a -	1 2 3 4 - -	80	B.
rubiginosa	i w e	s m -	c - -	1 2 - - - -	30	E.
canina	i w e	s m n	c a -	1 2 3 - - -	90	B.
systyla	i w e	s - -	c - -	1 2 - - - -	16	E.
arvensis	i w e	s m -	c - -	1 2 - - - -	63	E.

## SANGUISORBA

officinalis	i w e	s m -	c a -	1 2 3 - - -	49	I. e.
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## POTERIUM

Sanguisorba	i w e	s m n	c a -	1 2 3 - - -	57	E.
muricatum	- w e	s - -	c - -	1 - - - - -	11	E.

## ALCHEMILLA

vulgaris	i w e	s m n	c a u	1 2 3 4 5 6	70	B. s.
alpina	i w e	- m n	c a u	- - 3 4 5 6	22	H.
arvensis	i w e	s m n	c a -	1 2 3 - - -	85	B.

## AGRIMONIA

Eupatoria	i w e	s m n	c a -	1 2 3 - - -	82	B. e.
odorata	i w e	s m -	c - -	1 2 - - - -	8	E.

## MESPILUS

germanica	- w e	s - -	c - -	1 - - - - -	6	E.
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## CRATÆGUS

Oxyacantha	i w e	s m n	c a -	1 2 3 - - -	85	B.
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## COTONEASTER

vulgaris	- w -	s - -	c - -	1 - - - - -	1	L. a.
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## PYRUS

communis	i w e	s m -	c - -	1 - - - -	27	E. g.
Malus	i w e	s m -	c a -	1 2 3 - - -	60	E.
torminalis	- w e	s m -	c - -	1 - - - -	35	E.
Aria	i w e	s m n	c a -	1 2 3 - - -	41	E.
Aucuparia	i w e	s m n	c a u	1 2 3 4 5 -	70	B.

25. *Onagraceæ*. Species 13. Census 626.

## EPILOBIUM

angustifolium	i w e	s m n	c a -	1 2 3 4 5 -	70	B. ?
hirsutum	i w e	s m n	c ? -	1 2 - - - -	72	E. b.
parviflorum	i w e	s m n	c a -	1 2 3 - - -	74	B. e.
montanum	i w e	s m n	c a -	1 2 3 4 - -	95	B.
lanceolatum	- w e	s - -	c - -	1 - - - -	4	E.
roseum	i w e	s m n	c - -	1 2 - - - -	25	E.
palustre	i w e	s m n	c a -	1 2 3 4 - -	82	B.
tetragonum	i w e	s m n	c a -	1 2 3 4 - -	77	B.
alsinifolium	- w e	s m n	? a u	- - 3 4 5 -	16	H.
alpinum	- w e	- - n	- a u	- - - 4 5 6	13	H.

## ISNARDIA

palustris	- - e	s - -	c - -	1 - - - -	2	E.
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## CIRCÆA

lutetiana	i w e	s m n	c a -	1 2 3 - - -	76	B. e.
alpina	i w e	s m n	c a -	- 2 3 - - -	20	S. h.

26. *Haloragiaceæ*. Species 4. Census 189.

## HIPPURIS

vulgaris	i w e	s m n	c a -	1 2 3 - - -	67	B. ?
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## MYRIOPHYLLUM

verticillatum	i w e	s m -	c - -	1 - - - -	29	E. g.
spicatum	i w e	s m n	c a -	1 2 3 - - -	60	B. ?
alterniflorum	i w e	s m n	c a -	1 2 3 - - -	33	B.

26\*. *Callitrichaceæ*. Species 4. Census 169.

## CALLITRICHE

verna	i w e	s m n	c a -	1 2 3 - - -	86	B.
pedunculata	i w e	s m n	c a u	1 2 3 4 - -	36	B.
platycarpa	i w e	s m n	c a -	1 2 3 - - -	41	B.
autumnalis	i w e	s m n	c ? -	? 2 3 - - -	6	S.

26.\* *Ceratophyllaceæ*. Species 2. Census 44.

## CERATOPHYLLUM

demersum	i w e	s m n	c - -	1 2 3 - - -	35	E. b.
submersum	i w e	s m -	c - -	1 2 - - - -	9	E.



27. *Lythraceæ*. Species 3. Census 148.

## LYTHRUM

hyssopifolium	i ? e	s ? -	c - -	1 2 - - -	6	G.
Salicaria	i w e	s m n	c - -	1 2 ? - -	76	E. b.

## PEPLIS

Portula	i w e	s m n	c a -	1 2 3 - -	66	B.
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29. *Cucurbitaceæ*. Species 1. Census 50.

## BRYONIA

dioica	- w e	s m -	c - -	1 2 - - -	50	E. g.
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30. *Portulacaceæ*. Species 1. Census 80.

## MONTIA

fontana	i w e	s m n	c a u	1 2 3 4 5 6	80	B.
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31. *Illecebraceæ*. Species 6. Census 89.

## ILLECEBRUM

verticillatum	- w -	s - -	c - -	1 - - - -	3	A.
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## CORRIGIOLA

littoralis	- w -	s - -	c - -	1 - - - -	2	A.
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## HERNIARIA

glabra	i w e	s m -	c - -	1 - - - -	4	G. e.
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## POLYCARPON

tetraphyllum	- w -	s - -	c - -	1 - - - -	3	A.
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## SCLERANTHUS

annuus	i w e	s m n	c a -	1 2 3 - -	73	B.
perennis	- w e	s - -	c - -	1 - - - -	4	E. g.

33. *Grossulariaceæ*. Species 4. Census 110. (*Dubious* 2—50).

## RIBES

nigrum	i w e	s m n	c - -	1 2 - - -	20?	I. ?
rubrum	i w e	? m n	c a -	1 2 3 - -	40?	I. ?
alpinum	- w e	s m -	c a -	1 2 3 - -	20?	I. ?
Grossularia	i w e	s m -	c a -	1 2 - - -	30?	I. ?

34. *Crassulaceæ*. Species 11. Census 330. (*Dubious* 2—25).

## TILLÆA

muscosa	- w e	s - -	c - -	1 - - - -	6	G.
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## SEDUM

Rhodiola	i w e	s m n	c a u	- 2 3 4 5 6	26	H.
Telephium	i w e	s m n	c a -	1 2 3 - -	60	E. b.
villosum	- w e	- m n	c a -	- - 3 4 - -	24	H.
anglicum	i w e	s m n	c a u	1 2 3 4 5 -	42	A. b.
album	? w -	s - -	? a -	? 2 - - -	5	L. a.

## SEDUM

acre	i w e	s m n	c a -	1 2 3 - - -	85	B.
reflexum	i w e	s m -	c - -	1 2 - - - -	20	E. a.
rupestre	i w -	s m -	c a -	1 2 - - - -	11	A.
Forsterianum	- w -	s - -	c - -	1 2 - - - -	5	A.

## COTYLEDON

Umbilicus	i w e	s m n	c a -	1 2 3 - - -	46	A. e.
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35. *Saxifragaceæ*. Species 14. Census 449.

## SAXIFRAGA

stellaris	i w e	s m n	c a u	- - 3 4 5 6	30	H.
nivalis	i w e	s m n	- - u	- - - - 5 6	10	H.
Hirculus	i w e	- m n	c a -	- 2 3 - - -	9	I. s.
aizoides	i w e	- m n	c a u	- 2 3 4 5 6	25	H.
oppositifolia	i w e	s m n	c a u	- - 3 4 5 6	22	H.
granulata	i w e	s m n	c a -	1 2 3 - - -	50	B. i.
cernua	- - e	- - n	- - u	- - - - - 6	1	H.
rivularis	- w e	- - n	- - u	- - - - - 6	3	H.
tridactylites	i w e	s m n	c a -	1 2 3 - - -	64	B. e.
hypooides	i w e	s m u	c a u	1 2 3 4 5 6	35	S. h.
cæspitosa	? - e	? - n	- - u	- - - - - 6	1	H.

## CHRYSOSPLENIUM

oppositifolium	i w e	s m n	c a u	1 2 3 4 5 6	82	B. h.
alternifolium	i w e	s m n	c a u	1 2 3 4 5 -	53	B. i.

## PARNASSIA

palustris	i w e	s m n	c a u	1 2 3 4 5 -	64	S. b.
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36. *Araliaceæ*. Species 2. Census 159.

## ADOXA

moschatellina	i w e	s m n	c a u	1 2 3 4 5 6	70	B.
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## HEDERA

Helix	i w e	s m n	c a -	1 2 3 - - -	89	B.
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37. *Cornaceæ*. Species 2. Census 65.

## CORNUS

sanguinea	i w e	s m -	c a -	1 2 - - - -	54	E.
suecica	- w e	- m n	c a u	- - 3 4 5 -	11	H.

38. *Umbelliferaæ*. Species 57. Census 2383. (*Dubious* 11—349).

## HYDROCOTYLE

vulgaris	i w e	s m n	c a -	1 2 3 - - -	81	B.
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## SANICULA

europæa	i w e	s m n	c a -	1 2 3 - - -	74	B.
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## ERYNGIUM

maritimum	i w e	s m n	c - -	1 2 3 - - -	41	B.
campestre	i w e	s m -	c - -	1 2 - - - -	5	E.

## CONIUM

maculatum	i w e	s m n	c a -	1 2 3 - - -	86	B.
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## PHYSOSPERMUM

cornubiense	- w -	s - -	c - -	1 - - - - -	2	A.
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## SMYRNIUM

Olusatrum	i w e	s m -	c - -	1 2 - - - -	35	E.
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## CICUTA

virosa	i w e	s m n	c - -	1 2 - - - -	20	E. ?
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## APIUM

graveolens	i w e	s m n	c - -	1 2 - - - -	46	E.
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## PETROSELINUM

segetum	i w e	s m -	c - -	1 - - - - -	30	E.
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## TRINIA

vulgaris	i w -	s - -	c - -	1 - - - - -	3	A.
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## HELOSCIADIUM

nodiflorum	i w e	s m n	c - -	1 2 - - - -	67	E.
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inundatum	i w e	s m n	c a -	1 2 3 - - -	60	B.
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## SISON

Amomum	- w e	s m -	c - -	1 2 - - - -	47	E.
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## ÆGOPODIUM

Podagraria	i w e	s m n	c - -	1 2 3 - - -	68	B. e.
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## CARUM

Carui	- w e	- m -	c - -	- 2 - - - -	3	I. ?
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verticillatum	i w -	s m n	c ? -	1 2 3 - - -	15	A.
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Bulbocastanum	- - e	s - -	c - -	1 - - - - -	3	G.
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## BUNIUM

flexuosum	i w e	s m n	c a -	1 2 3 - - -	80	B.
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## PIMPINELLA

Saxifraga	i w e	s m n	c a -	1 2 3 4 - -	86	B.
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magna	i w e	s m n	c - -	1 2 - - - -	37	E. g.
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## SIUM

latifolium	i w e	s m n	c - -	1 2 - - - -	32	E. g.
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angustifolium	i w e	s m n	c - -	1 2 - - - -	60	E. b.
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## BUPLEURUM

tenuissimum	- w e	s m -	c - -	1 2 - - - -	20	E. g.
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aristatum	- w -	s - -	c - -	1 - - - - -	1	A. l.
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rotundifolium	- w e	s m -	c - -	1 2 - - - -	35	G.
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**CENANTHE**

<i>fistulosa</i>	i w e	s m n	c - -	1 2 3 - - -	52	E. b.
<i>pimpinelloides</i>	- w e	s - -	c - -	1 - - - - -	11	E.
<i>Lachenalii</i>	i w e	s m n	c - -	1 2 - - - -	53	E. b.
<i>silaifolia</i>	- w e	s m -	c - -	1 - - - - -	13	E. g.
<i>crocata</i>	i w e	s m n	c a -	1 2 3 - - -	68	B. e.
<i>Phellandrium</i>	i w e	s m -	c - -	1 2 - - - -	44	E. g.
<i>fluviatilis</i>	- w e	s m -	c - -	1 - - - - -	15	E. g.

**ÆTHUSA**

<i>Cynapium</i>	i w e	s m n	c a -	1 2 3 - - -	74	B. e.
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**FENICULUM**

<i>vulgare</i>	i w e	s - -	c - -	1 - - - - -	22	E.
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**SESELI**

<i>Libanotis</i>	- - e	s - -	c - -	1 - - - - -	3	G. l.
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**LIGUSTICUM**

<i>scoticum</i>	i w e	- m n	c - -	- 2 3 - - -	19	S.
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**SILAU**

<i>pratensis</i>	i w e	s m -	c a -	1 2 - - - -	53	E.
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**MEUM**

<i>athamanticum</i>	- w e	s m n	c a -	- 2 3 - - -	19	S. i.
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**CRITHMUM**

<i>maritimum</i>	i w e	s m -	c - -	1 2 - - - -	24	A.
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**ANGELICA**

<i>sylvestris</i>	i w e	s m n	c a u	1 2 3 4 5 -	91	B.
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**PEUCEDANUM**

<i>officinale</i>	- - e	s - -	c - -	1 - - - - -	2	G.
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<i>palustre</i>	- w e	s m -	c - -	1 - - - - -	9	G.
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**PASTINACA**

<i>sativa</i>	i w e	s m -	c - -	1 2 - - - -	43	E.
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**HERACLEUM**

<i>Sphondylium</i>	i w e	s m n	c a u	1 2 3 4 5 -	95	B.
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**TORDYLIUM**

<i>maximum</i>	- - e	s - -	c - -	1 - - - - -	3	L. e.
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**DAUCUS**

<i>Carota</i>	i w e	s m n	c a -	1 2 3 - - -	87	B.
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<i>maritimus</i>	i w e	s - -	c - -	1 - - - - -	10	A. e.
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**CAUCALIS**

<i>daucoides</i>	- w e	s m -	c - -	1 2 - - - -	19	G.
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## TORILIS

Anthriscus	i w e	s m n	c a -	1 2 3 - - -	82	B. e.
infesta	i w e	s m -	c - -	1 2 - - - -	42	E.
nodosa	i w e	s m n	c - -	1 2 - - - -	58	E.

## SCANDIX

Pecten	i w e	s m n	c a -	1 2 3 - - -	72	B. e.
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## ANTHRISCUS

vulgaris	i w e	s m n	c - -	1 2 3 - - -	56	B. ?
sylvestris	i w e	s m n	c a -	1 2 3 - - -	83	B.

## CHEROPHYLLUM

temulentum	i w e	s m n	c a -	1 2 3 - - -	79	B. e.
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## MYRRHIS

odorata	i w e	s m n	c a -	1 2 3 - - -	45	I. s.
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39. *Loranthaceæ*. Species 1. Census 33.

## VISCUM

album	- w e	s m -	c - -	1 2 - - - -	33	E. g.
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40. *Caprifoliaceæ*. Species 6. Census 326. (*Dubious* 1—47).

## SAMBUCUS

nigra	i w e	s m -	c a -	1 2 ? - - -	71	B. e.
Ebulus	i w e	s m -	c - -	1 2 3 - - -	47	E.

## VIBURNUM

Opulus	i w e	s m n	c a -	1 2 3 - - -	71	B. e.
Lantana	- w e	s m -	c - -	1 2 - - - -	35	E. g.

## LONICERA

Periclymenum	i w e	s m n	c a -	1 2 3 - - -	90	B.
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## LINNÆA

borealis	- w e	- m n	c a u	- 2 3 4 5 -	12	S. h.
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41. *Rubiaceæ*. Species 18. Census 869. (*Dubious* 2—32).

## RUBIA

peregrina	i w e	s - -	c - -	1 - - - - -	18	A.
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## GALIUM

verum	i w e	s m n	c a -	1 2 3 4 - -	92	B.
cruciatum	- w e	s m n	c a -	1 2 3 - - -	76	B. e.
palustre	i w e	s m n	c a -	1 2 3 - - -	92	B.
uliginosum	i w e	s m n	c - -	1 2 3 - - -	55	B. e.
saxatile	i w e	s m n	c a u	1 2 3 4 5 6	88	B.
erectum	i w e	s m ?	c - -	1 2 - - - -	20	G.
Mollugo	i w e	s m n	c a -	1 2 3 - - -	60	E. h.
sylvestre	i w e	s m n	c a -	1 2 3 4 - -	16	I. h.

## GALIUM

montanum	- - e	- m -	- a -	- 2 - - - -	1	L. i.
anglicum	- - e	s - -	c - -	1 - - - - -	6	G.
tricorne	- w e	s m -	c - -	1 2 - - - -	31	G. e.
Aparine	i w e	s m n	c a -	1 2 3 - - -	92	B.
Vaillantii	- - e	s - -	c - -	1 - - - - -	1	G.
boreale	i w e	s m n	c a u	- 2 3 4 5 -	34	H.

## SHERARDIA

arvensis	i w e	s m n	c a -	1 2 3 - - -	82	B. e.
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## ASPERULA

odorata	i w e	s m n	c a -	1 2 3 - - -	74	B.
cynanchica	i w e	s m -	c - -	1 2 - - - -	31	E.

42. *Valerianaceæ. Species 5. Census 301. (Dubious 3—156).*

## VALERIANA

dioica	- w e	s m n	c a -	1 2 3 - - -	59	E.
officinalis	i w e	s m n	c a -	1 2 3 4 - -	86	B.

## FEDIA

olitoria	i w e	s m n	c - -	1 2 3 - - -	70	B.
Auricula	i w e	s m n	c - -	1 2 - - - -	17	E.
dentata	i w e	s m n	c - -	1 2 3 - - -	69	E. b.

43. *Dipsacæ. Species 5. Census 328.*

## DIPSACUS

sylvestris	i w e	s m n	c - -	1 2 - - - -	58	E.
pilosus	- w e	s m -	c - -	1 2 - - - -	40	E. g.

## SCABIOSA

succisa	i w e	s m n	c a u	1 2 3 4 5 -	95	B.
columbaria	- w e	s m n	c a -	1 2 3 - - -	55	E.

## KNAUTIA

arvensis	i w e	s m n	c a -	1 2 3 - - -	80	B.
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44. *Compositæ. Species 136. Census 6000. (Dubious 9—385).*

## TRAGOPOGON

pratensis	i w e	s m n	c a -	1 2 3 - - -	69	B. e.
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## HELMINTHIA

echioides	i w e	s m -	c - -	1 2 - - - -	50	E.
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## PICRIS

hieracioides	i w e	s m -	c - -	1 2 - - - -	39	E.
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## THRINICIA

hirta	i w e	s m n	c - -	1 2 - - - -	53	E.
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## APARGIA

hispida	i w e	s m n	c a -	1 2 3 - - -	63	E. b.
autumnalis	i w e	s m n	c a u	1 2 3 4 5 6	90	B.

## HYPOCHÆRIS

glabra	- w e	s m n	c - -	1 2 3 - - -	26	G. b.
maculata	- w e	s - -	c - -	1 - - - - -	5	E.
radicata	i w e	s m n	c a -	1 2 3 4 - -	92	B.

## LACTUCA

virosa	- w e	s m n	c - -	1 2 - - - -	32	G.
Scariola	- w e	s - -	c - -	1 - - - - -	5	G.
saligna	- w e	s - -	c - -	1 - - - - -	6	G.
muralis	i w e	s m n	c a -	1 2 3 - - -	50	E.

## SONCHUS

palustris	- - e	s - -	c - -	1 - - - - -	5	G.
arvensis	i w e	s m n	c a -	1 2 3 - - -	84	B.
asper	i w e	s m n	c a -	1 2 3 - - -	50	B.
oleraceus	i w e	s m n	c a -	1 2 3 - - -	91	B.

## MULGEDIUM

alpinum	- - e	- - n	- - u	- - - - 5 -	2	H.
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## CREPIS

virens	i w e	s m n	c a -	1 2 3 - - -	80	B.
biennis	i - e	s m -	c - -	1 2 - - - -	8	G.
succisæfolia	i w e	- m n	c a -	- 2 3 4 - -	10	I. h.
paludosa	i w e	s m n	c a -	- 2 3 4 - -	43	S. h.

## HIERACIUM

Pilosella	i w e	s m n	c a u	1 2 3 4 - -	90	B.
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*Sp. Backhousianaæ.* (Distribution imperfectly ascertained).

alpinum	- - e	- - n	- - u	- - - - - 6	2	H.
holosericeum	- w e	- m n	- - u	- - - - 5 6	6	H.
eximium	- w e	- - n	- - u	- - - - 5 -	3	H.
calenduliflorum	- - e	- - n	- - u	- - - - - 6	2	H.
gracilentum	- - e	- - n	- - u	- - - - 5 6	2	H.
globosum	- - e	- - n	- - u	- - - - 5 6	1	H.
nigrescens	- w e	- - n	- - u	- - - - 5 -	4	H.
lingulatum	- w e	- - n	- a u	- - - 4 5 -	4	H.
senescens	- - e	- - n	- - u	- - - - 5 -	3	H.
chrysanthum	- w e	- m n	- - u	- - - - 5 6	6	H.
anglicum	i w e	- m n	c a u	- - 3 4 5 -	10	H.
iricum	i w e	- m n	c a -	- - 3 4 - -	7	H.

## HIERACIUM

pallidum	- w e	s m n	c a u	- - 3 4 5 -	23	H. s.
lasiophyllum	- w e	s - n	- a u	- - 3 4 5 -	4	H.
argenteum	- w e	s m n	- a u	- - - 4 5 -	12	H.
nitidum	- - e	- - n	- a u	- - - 4 5 -	1	H.
aggregatum	- - - e	- - n	- a u	- - - 4 5 -	1	H.
murorum	i w e	s m n	c a u	1 2 3 4 5 -	58	B.
caesium	i w e	- m n	c a u	1 2 3 4 5 -	?	S. ?
flocculosum	- - e	- - n	- a u	- - - 4 5 -	2	H.
vulgatum	i w e	s m n	c a u	1 2 3 4 5 6	73	B.
gothicum	i w e	s m n	- a -	- - 3 4 - -	9	H.
tridentatum	i w e	s m -	c a -	1 2 - - - -	17	E.
preanthoides	i - e	- m n	c a -	- - 3 4 - -	6	H.
(denticulatum, S.)	- w e	- m n	- ? -	- - 3 - - -	2	S. ?
strictum	i w e	- m n	c a -	- - 3 - - -	10	H.
umbellatum	i w e	s m n	c a -	1 2 3 - - -	59	B. e.
crocatum	i - e	- m n	- a -	- - 3 - - -	9	H.
rigidum	i w e	- m n	c a -	- - 3 - - -	11	H. i.
corymbosum	- - e	- m n	- a -	- - 3 - - -	2	H.
boreale	i w e	s m n	c a -	1 2 3 - - -	67	B. e.

## BARKHAUSIA

fœtida	- - e	s - -	c - -	1 - - - - -	6	G.
taraxacifolia	- w e	s - -	c - -	1 - - - - -	5	G. e.

## TARAXACUM

officinale	i w e	s m n	c a u	1 2 3 4 5 -	95	B.
palustre	i w e	s m n	c a u	1 2 3 4 5 6	40	B. s.

## ARNOSERIS

pusilla	- ? e	s m ?	c - -	1 2 3 - - -	12	G.
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## LAPSANA

communis	i w e	s m n	c a -	1 2 3 - - -	90	B.
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## CICHORIUM

Intybus	i w e	s m n	c - -	1 2 ? - - -	67	E. b.
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## ARCTIUM

Lappa	i w e	s m n	c a -	1 2 3 - - -	95	B.
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## SAUSSUREA

alpina	i w e	s m n	- a u	- - - 4 5 6	16	H.
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## SERRATULA

tinctoria	- w e	s m -	c a -	1 2 - - - -	54	E.
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## CARDUUS

nutans	i w e	s m -	c a -	1 2 3 - - -	62	E.
acanthoides	i w e	s m n	c a -	1 2 3 - - -	67	B. e.
tenuiflorus	i w e	s m n	c - -	1 2 - - - -	49	E. b.
lanceolatus	i w e	s m n	c a -	1 2 3 4 - -	95	B.
eriphorus	i w e	s m -	c - -	1 2 - - - -	33	E. g.
palustris	i w e	s m n	c a u	1 2 3 4 5 -	90	B.
arvensis	i w e	s m n	c a -	1 2 3 - - -	90	B.
pratensis	i w e	s m -	c - -	1 2 - - - -	39	E.
tuberosus	- w -	s - -	c - -	1 - - - - -	1	L. e.
acaulis	- w e	s m -	c - -	1 ? - - - -	31	E. g.
heterophyllus	- w e	s m n	c a -	- 2 3 4 - -	36	S. h.

## ONOPORDUM

Ācanthium	- w e	s m n	c - -	1 2 - - - -	37	E.
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## CARLINA

vulgaris	i w e	s m n	c a -	1 2 3 - - -	62	E. b.
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## CENTAUREA

nigrescens	i w e	s m n	c - -	1 2 - - - -	27	E.
nigra	i w e	s m n	c a -	1 2 3 - - -	92	B.
Cyanus	i w e	s m n	c a -	1 2 3 - - -	66	B.
Scabiosa	i w e	s m n	c a -	1 2 3 - - -	67	B. e.
Calcitrapa	i w e	s - -	c - -	1 - - - - -	15	E. g.

## BIDENS

cernua	i w e	s m n	c - -	1 2 3 - - -	58	E. b.
tripartita	i w e	s m n	c - -	1 2 - - - -	62	E. b.

## EUPATORIUM

cannabinum	i w e	s m u	c - -	1 2 3 - - -	80	B. e.
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## CHRYSOCOMA

Linosyris	- w -	s - -	c - -	1 - - - - -	3	A.
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## DIOTIS

maritima	- w e	s - -	c - -	1 - - - - -	3	E.
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## TANACETUM

vulgare	i w e	s m n	c ? -	1 2 3 - - -	70	B.
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## ARTEMISIA

campestris	- - e	s - -	c - -	1 - - - - -	2	G.
maritima	i w e	s m n	c - -	1 2 - - - -	36	E.
Absinthium	i w e	s m n	c a -	1 2 - - - -	50	E.
vulgaris	i w e	s m n	c a -	1 2 3 - - -	88	B.



## GNAPHALIUM

dioicum	i w e	s m n	c a u	1 2 3 4 5 6	65	S. b.
sylvaticum	i w e	s m n	c a -	1 2 3 - - -	72	B.
norvegicum	- - e	- - n	- - u	- - - - 5 -	2	H.
supinum	- w e	- - n	- a u	- - - 4 5 6	12	H.
uliginosum	i w e	s m n	c a -	1 2 3 - - -	82	B.

## FILAGO

gallica	- - e	s - -	c - -	1 - - - - -	3	G.
minima	i w e	s m n	c a -	1 2 3 - - -	61	B.
germanica	i w e	s m n	c a -	1 2 3 - - -	72	B.
apiculata	- w e	s m -	c - -	1 2 - - - -	9	G.
spatulata	- w e	s m -	c - -	1 - - - - -	13	G.

## PETASITES

vulgaris	i w e	s m n	c a -	1 2 3 - - -	71	B. e.
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## TUSSILAGO

Farfara	i w e	s m n	c a u	1 2 3 4 5 -	87	B.
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## ERIGERON

alpinus	- - e	- - n	- - u	- - - - 5 -	2	H.
acris	i w e	s m n	c - -	1 2 - - - -	53	E.

## ASTER

Tripolium	i w e	s m n	c - -	1 2 3 - - -	56	B.
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## SOLIDAGO

Virgaurea	i w e	s m n	c a u	1 2 3 4 5 6	86	B.
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## SENECIO

vulgaris	i w e	s m n	c a -	1 2 3 - - -	95	B.
sylvaticus	i w e	s m n	c a -	1 2 3 - - -	79	B.
viscosus	- w e	s m n	c - -	1 2 - - - -	21	G. b.
erucæfolius	i w e	s m -	c - -	1 2 - - - -	60	E.
Jacobæa	i w e	s m n	c a -	1 2 3 4 - -	95	B.
aquaticus	i w e	s m n	c a -	1 2 3 - - -	91	B.
paludosus	- - e	s ? -	c - -	1 - - - - -	3	G.
saracenicus?	i w e	s m -	c - -	1 2 - - - -	17	I. ?

## CINERARIA

palustris	- - e	s - -	c - -	1 - - - - -	3	G.
campestris	- w e	s - -	c - -	1 - - - - -	15	G. e.

## INULA

Helenium	i w e	s m -	c - -	1 2 - - - -	30	E. a.
Conyza	- w e	s m -	c - -	1 2 - - - -	50	E.
crithnoides	i w e	s m -	c - -	1 2 - - - -	16	A. e.

## PULICARIA

dysenterica	i w e	s m n	c - -	1 2 - - -	69	E.
vulgaris	- w e	s - -	c - -	1 - - - -	18	G.

## BELLIS

perennis	i w e	s m n	c a u	1 2 3 4 5 -	97	B.
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## CHRYSANTHEMUM

segetum	i w e	s m n	c a -	1 2 3 - - -	85	B.
Leucanthemum	i w e	s m n	c a -	1 2 3 - - -	87	B.

## PYRETHRUM

Parthenium	i w e	s m n	c a -	1 2 3 - - -	70	B. e.
inodorum	i w e	s m n	c a -	1 2 3 - - -	90	B.
maritimum	i w e	s m n	c - -	1 2 3 - - -	39	B.

## MATRICARIA

Chamomilla	i w e	s m -	c - -	1 2 - - - -	45	E.
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## ANTHEMIS

nobilis	i w e	s m n	c - -	1 2 - - - -	37	E.
arvensis	i w e	s m n	c a -	1 2 3 - - -	44	E. b.
Cotula	i w e	s m n	c - -	1 2 - - - -	58	E. b.

## ACHILLEA

Ptarmica	i w e	s m n	c a -	1 2 3 4 - -	89	B.
Millefolium	i w e	s m n	c a u	1 2 3 4 5 6	96	B.

45. *Campanulaceæ*. Species 14. Census 440. (Dubious 2-53).

## CAMPANULA

rotundifolia	i w e	s m n	c a u	1 2 3 4 5 6	94	B.
patula	- w e	s m -	c - -	1 2 - - - -	21	E.
Rapunculus	- w e	s - -	c - -	1 - - - - -	13	E.
latifolia	i w e	s m n	c a -	1 2 3 - - -	52	S. i.
rapunculoides	- w e	s m n	c - -	1 2 - - - -	6	L. i.
Trachelium	i w e	s m n	c - -	1 2 - - - -	41	E.
glomerata	- w e	s m n	c a -	1 2 - - - -	42	G. e.

## WAHLENBERGIA

hederacea	i w e	s m -	c - -	1 2 ? - - -	34	A.
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## SPECULARIA

hybrida	- w e	s m -	c - -	1 2 - - - -	40	G. e.
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## PHYTEUMA

orbiculare	- w e	s - -	c - -	1 - - - - -	7	G. e.
spicatum	- - e	s - -	c - -	1 - - - - -	1	G.

## JASIONE

montana	i w e*	s m n	c a -	1 2 3 - - -	63	B. e.
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## LOBELIA

urens	- w -	s - -	c - -	1 - - - -	1	A.
Dortmanna	i w e	s m n	c a -	1 2 3 4 - -	25	S. h.

46. *Ericaceæ*. Species 20. Census 667.

## ERICA

Tetralix	i w e	s m n	c a u	1 2 3 4 - -	91	B.
ciliaris	i w -	s - -	c - -	1 - - - -	3	A.
cinerea	i w e	s m n	c a u	1 2 3 4 - -	88	B.
vagans	i w -	s - -	c - -	1 - - - -	1	A.

## CALLUNA

vulgaris	i w e	s m n	c a u	1 2 3 4 5 -	95	B.
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## MENZIESIA

cærulea	- - e	- - n	- - u	- - - - 5 -	1	H.
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## AZALEA

procumbens	- w e	- - n	- a u	- - - 5 6	15	H.
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## ANDROMEDA

polifolia	i w e	s m n	c - -	1 2 3 - - -	19	I. s.
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## ARBUTUS

alpina	- w e	- - n	c a u	- - 3 4 5 6	9	H.
Uva-ursi	i w e	- m n	c a u	- - 3 4 5 -	25	H.

## VACCINIUM

Myrtillus	i w e	s m n	c a u	1 2 3 4 5 6	76	B. h.
uliginosum	- w e	- m n	- a u	- - 3 4 5 6	16	H.
Vitis-Idæa	i w e	s m n	c a u	- 2 3 4 5 6	43	H. s.
Oxycoccus	i w e	s m n	c a u	1 2 3 4 5 -	52	B. i.

## PYROLA

rotundifolia	? w e	s m n	c a u	1 2 3 4 5 -	16	G. ?
media	i w e	s m n	c a -	1 2 3 4 - -	24	S.
minor	i w e	s m n	c a -	1 2 3 - - -	45	S. g.
secunda	i w e	- m n	c a u	- - 3 4 5 -	14	S.
uniflora	- w e	- - n	c - -	- - 3 - - -	6	S.

## MONOTROPA

Hypopitys	i w e	s m n	c - -	1 2 3 - - -	28	G. e.
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47. *Ilicaceæ*. Species 1. Census 72.

## ILEX

Aquifolium	i w e	s m n	c a -	1 2 3 - - -	72	B.
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48. *Jasminaceæ*. Species 2. Census 132.

## LIGUSTRUM

vulgare	- w e	s m -	c - -	1 2 - - - -	54	E.
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## FRAXINUS

excelsior	i	w	e	s	m	n	c	a	-	1	2	3	-	-	-	78	B.
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49. *Apocynaceæ*. Species 1. Census 18. (*Dubious* 1—18).

## VINCA

minor	i	w	e	s	-	-	c	-	-	1	-	-	-	-	-	18	E.
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50. *Gentianaceæ*. Species 14. Census 474.

## GENTIANA

verna	i	w	e	-	m	-	-	a	u	-	-	3	4	-	-	3	I. b.
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Pneumonanthe	-	w	e	s	m	-	c	-	-	1	2	-	-	-	-	25	E. g.
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nivalis	-	-	e	-	-	n	-	-	u	-	-	-	-	5	6	2	H.
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Amarella	i	w	e	s	m	n	c	a	-	1	2	3	4	-	-	68	B. g.
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campestris	i	w	e	s	m	n	c	a	u	1	2	3	4	5	-	77	B. s.
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## CICENDIA

filiformis	i	w	e	s	-	-	c	-	-	1	-	-	-	-	-	7	E. a.
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## ERYTHRÆA

Centaureum	i	w	e	s	m	n	c	-	-	1	2	3	-	-	-	85	B.
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littoralis	i	w	e	s	m	n	c	-	-	1	2	-	-	-	-	28	B.
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pulchella	i	w	e	s	m	-	c	-	-	1	2	-	-	-	-	29	E.
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latifolia	?	w	-	-	m	-	c	-	-	-	2	-	-	-	-	1	L.
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## CHLORA

perfoliata	i	w	e	s	m	-	c	-	-	1	2	-	-	-	-	51	E.
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## VILLARSIA

nymphæoides	-	w	e	s	-	-	c	-	-	1	-	-	-	-	-	11	G.
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## MENYANTHES

trifoliata	i	w	e	s	m	n	c	a	-	1	2	3	4	-	-	82	B.
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## POLEMONIUM

cæruleum	i	w	e	s	m	-	c	a	-	-	2	3	-	-	-	5	I.
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51. *Convolvulaceæ*. Species 3. Census 170.

## CONVOLVULUS

arvensis	i	w	e	s	m	n	c	-	-	1	2	3	-	-	-	70	E. b.
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sepium	i	w	e	s	m	n	c	-	-	1	2	?	-	-	-	69	E. b.
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Soldanella	i	w	e	s	m	n	c	-	-	1	2	-	-	-	-	31	E.
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51.\* *Cuscutaceæ*. Species 3. Census 59. (*Dubious* 1—11).

## CUSCUTA

europæa	-	w	e	s	m	-	c	-	-	1	2	-	-	-	-	20	E.
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Epithymum	-	w	e	s	m	-	c	-	-	1	2	-	-	-	-	28	E.
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Trifolii	-	w	e	s	m	-	c	-	-	1	2	-	-	-	-	11	E. g.
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52. *Solanaceæ*. Species 4. Census 229. (*Dubious* 1—30).

## HYOSCYAMUS

niger	i	w	e	s	m	n	c	-	-	1	2	3	-	-	-	70	E. b.
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## SOLANUM

nigrum	i w e	s m -	c - -	1 2 - - -	49	E.
Dulcamara	i w e	s m n	c a -	1 2 3 - -	80	B. e.

## ATROPA

Belladonna	i w e	s m -	c a -	1 2 - - -	30	E.
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53. *Scrophulariaceæ. Species 48. Census 2211. (Dubious 8-214).*

## VERBASCUM

Thapsus	i w e	s m n	c - -	1 2 - - -	67	E. b.
Lychnitis	- w e	s - -	c - -	1 - - - -	11	E.
floccosum	- - e	s - -	c - -	1 - - - -	4	G.
nigrum	- w e	s m -	c - -	1 2 - - -	34	E.
Blattaria	- w e	s - -	c - -	1 2 - - -	12	E.
virgatum	i w -	s - -	c - -	1 - - - -	3	A.

## VERONICA

spicata	- w e	s m -	c a -	1 2 - - -	9	E.
arvensis	i w e	s m -	c a -	1 2 3 - -	90	B.
verna	- - e	s - -	c - -	1 - - - -	2	G.
triphylls	- - e	s m -	c - -	1 2 - - -	6	G.
serpyllifolia	i w e	s m n	c a u	1 2 3 4 -	89	B.
humifusa	- w e	s m n	- ? u	- - - ? 5 6	9	H.
alpina	- w e	- - n	- - u	- - - - 5 6	5	H.
saxatilis	- w e	- - n	- - u	- - - - 5 6	4	H.
scutellata	i w e	s m n	c a -	1 2 3 4 -	76	B.
Anagallis	i w e	s m n	c a -	1 2 3 - -	76	B.
Beccabunga	i w e	s m n	c a u	1 2 3 4 5 -	89	B.
officinalis	i w e	s m n	c a u	1 2 3 4 5 -	87	B.
montana	i w e	s m n	c - -	1 2 3 - -	68	B. e.
Chamædrys	i w e	s m n	c a u	1 2 3 4 5 -	92	B.
hederifolia	i w e	s m n	c a -	1 2 3 - -	79	B.
agrestis	i w e	s m n	c a -	1 2 3 - -	85	B.
polita	i w e	s m n	c a -	1 2 - - -	61	B. e.
Buxbaumii	- w e	s m n	c - -	1 2 - - -	35	E.

## BARTSIA

alpina	i w e	- m n	- a u	- - - 4 5 -	5	I. h.
viscosa	i w e	s m n	c - -	1 2 - - -	17	A.
Odontites	i w e	s m n	c a -	1 2 3 - -	88	B.

## EUPHRASIA

officinalis	i w e	s m n	c a u	1 2 3 4 5 6	93	B.
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## RHINANTHUS

Crista-galli	i w e	s m n	c a u	1 2 3 4 5 -	90	B.
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## MELAMPYRUM

cristatum	- - e	s - -	c - -	1 - - - - -	9	G.
arvense	- - e	s - -	c - -	1 - - - - -	4	G.
pratense	i w e	s m n	e a u	1 2 3 4 5 -	83	B.
sylvaticum	i w e	- m n	c a -	- 2 3 - - -	16	S.

## PEDICULARIS

palustris	i w e	s m n	c a -	1 2 3 4 - -	87	B.
sylvatica	i w e	s m n	c a -	1 2 3 4 - -	89	B.

## SCROPHULARIA

nodosa	i w e	s m n	c a -	1 2 3 - - -	89	B.
Ehrharti	- w e	s m -	c - -	1 2 - - - -	10	E. i.
Balbisii	i w e	s m -	c - -	1 2 - - - -	60	E.
Scorodonia	i w -	s - -	c - -	1 - - - - -	2	A.

## DIGITALIS

purpurea	i w e	s m n	c a -	1 2 3 4 - -	88	B.
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## ANTIRRHINUM

Orontium	i w e	s - -	c - -	1 2 - - - -	33	E.
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## LINARIA

spuria	- w e	s m -	c - -	1 2 - - - -	35	E. g.
Elatine	i w e	s m -	c - -	1 2 - - - -	44	E.
repens	i w e	s m -	c - -	1 2 - - - -	18	E.
vulgaris	i w e	s m n	c - -	1 2 3 - - -	78	B. e.
minor	i w e	s m -	c - -	1 2 - - - -	48	E. g.

## LIMOSELLA

aquatica	- w e	s m -	c - -	1 2 - - - -	25	G. e.
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## SIETHORPIA

europæa	i w e	s - -	c - -	1 - - - - -	7	A.
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54. *Orobanchaceæ*. Species 10. Census 164.

## OROBANCHE

major (Angl.)	i w e	s m -	c - -	1 2 - - - -	44	E.
caryophyllacea	- - e	s - -	c - -	1 - - - - -	1	G.
elatior	i w e	s m -	c - -	1 2 - - - -	17	G.
minor	i w e	s m -	c - -	1 2 - - - -	30	G. e.
amethystea?	- w -	s - -	c - -	1 - - - - -	1	A.
pieridis	- w e	s - -	c - -	1 - - - - -	3	E.
hederæ	i w e	s - -	c - -	1 - - - - -	11	A.
rubra	i w e	s m n	c a -	1 2 3 - - -	7	S. a.
cærulea	- w e	s - -	c - -	1 - - - - -	5	E. g.

## LATHRÆA

squamaria	i w e	s m n	c - -	1 2 - - - -	45	E.
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55.\* *Verbenaceæ*. Species 1. Census 56.

## VERBENA

officinalis	i w e	s m n	c - -	1 2 - - -	56	E.
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55. *Lamiaceæ*. Species 47. Census 2366. (*Dubious* 9—229).

## SALVIA

verbenaca	i w e	s m n	c - -	1 2 - - -	48	E.
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pratensis	- - e	s - -	c - -	1 - - - -	2	G.
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## LYCOPUS

europæus	i w e	s m n	c - -	1 2 3 - - -	84	B. e.
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## MENTHA

rotundifolia	i w e	s m -	c - -	1 2 - - -	30	E.
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sylvestris	i w e	s m -	c - -	1 2 - - -	37	E.
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piperita	i w e	s m n	c - -	1 2 - - -	38	E.
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aquatica	i w e	s m n	c a -	1 2 3 - - -	83	B.
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sativa	i w e	s m n	c a -	1 2 - - -	55	B. e.
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arvensis	i w e	s m n	c a -	1 2 3 - - -	79	B.
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Pulegium	i w e	s m -	c - -	1 2 - - -	37	E.
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## THYMUS

Serpyllum	i w e	s m n	c a u	1 2 3 4 5 6	91	B.
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## ORIGANUM

vulgare	i w e	s m n	c a -	1 2 3 - - -	70	B. e.
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## CALAMINTHA

Acinos	i w e	s m n	c - -	1 2 3 - - -	57	B. e.
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Nepeta	- w e	s - -	c - -	1 2 - - -	21	E.
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officinalis	i w e	s m -	c - -	1 2 - - -	45	E.
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sylvatica	- - e	s - -	c - -	1 - - - -	1	E.
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Clinopodium	i w e	s m n	c a -	1 2 3 - - -	71	B. e.
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## MELITTIS

Melissophyllum	- w e	s - -	c - -	1 - - - -	9	A.
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## TEUCRIUM

Scorodonia	i w e	s m n	c a -	1 2 3 - - -	84	B.
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Scordium	i w e	s m -	c - -	1 2 - - -	6	G.
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Botrys	- - e	s - -	c - -	1 - - - -	1	G.
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## AJUGA

reptans	i w e	s m n	c a u	1 2 3 4 - -	83	B.
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pyramidalis	i w -	- - n	c a -	- - 3 4 - -	6	S.
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Chamæpitys	- w e	s - -	c - -	1 - - - -	10	G.
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## BALLOTA

nigra	i w e	s m n	c - -	1 2 - - -	56	E.
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## LAMIUM

Galeobdolon	i w e	s m -	c - -	1 2 - - - -	48	E.
album	i w e	s m n	c - -	1 2 ? - - -	71	B. e.
amplexicaule	i w e	s m n	c - -	1 2 3 - - -	74	B.
intermedium	i w e	s m n	c - -	1 2 3 - - -	15	S.
incisum	i w e	s m n	c a -	1 2 3 - - -	87	B.
purpureum	i w e	s m n	c a -	1 2 3 - - -	48	B.

## GALEOPSIS

Ladanium	i w e	s m n	c a -	1 2 3 - - -	56	E. b.
ochroleuca	- w e	s m -	c - -	1 2 - - - -	9	E. g.
Tetrahit	i w e	s m n	c a -	1 2 3 - - -	88	B.
versicolor	i w e	s m n	c - -	1 2 3 - - -	53	S. b.

## STACHYS

Betonica	i w e	s m -	c a -	1 2 3 - - -	65	E. b.
palustris	i w e	s m n	c a -	1 2 3 - - -	90	B.
ambigua	i w e	s m n	c a -	1 2 3 - - -	9	L. b.
sylvatica	i w e	s m n	c a -	1 2 3 - - -	90	B.
germanica	- - e	s - -	c - -	1 2 - - - -	3	L. g.
arvensis	i w e	s m n	c - -	1 2 3 - - -	73	B.

## GLECHOMA

hederacea	i w e	s m n	c a -	1 2 3 - - -	83	B.
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## NEPETA

Cataria	i w e	s m n	c - -	1 2 - - - -	44	E. g.
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## MARRUBIUM

vulgare	i w e	s m n	c - -	1 2 - - - -	38	E.
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## PRUNELLA

vulgaris	i w e	s m n	c a ?	1 2 3 4 - -	92	B.
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## SCUTELLARIA

galericulata	i w e	s m n	c - -	1 2 3 - - -	77	B.
minor	i w e	s m n	c - -	1 2 ? - - -	49	E. a.

56. *Boraginaceæ*. Species 21. Census 923. (Dubious 4—177).

## MYOSOTIS

palustris	i w e	s m n	c a -	1 2 - - - -	71	B. e.
repens	i w e	s m n	c a -	1 2 3 4 - -	35	B.
cæspitosa	i w e	s m n	c a -	1 2 3 - - -	68	B.
alpestris	- w e	- m n	- - u	- - - - 5 6	3	H.
sylvatica	i w e	s m -	c a -	1 2 - - - -	29	E. i.
arvensis	i w e	s m n	c a -	1 2 3 - - -	94	B.
collina	i w e	s m n	c a -	1 2 3 - - -	55	B.
versicolor	i w e	s m n	c a -	1 2 3 - - -	75	B.

## LITHOSPERMUM

officinale	i w e	s m n	c a -	1 2 3 - - -	58	B. e.
arvense	i w e	s m n	c - -	1 2 3 - - -	64	B.
p. cæruleum	- w e	s - -	c - -	1 - - - -	8	E. a.

## MERTENSIA

maritima	i w e	s m n	c - -	1 2 3 - - -	25	S.
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## SYMPHYTUM

officinale	i w e	s m n	c a -	1 2 - - - -	65	E. b.
tuberosum	- w e	s m n	c - -	? 2 ? - - -	15	S. i.

## LYCOPSIS

arvensis	i w e	s m n	c a -	1 2 3 - - -	82	B.
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## ANCHUSA

sempervirens	i w e	s m n	c - -	1 2 3 - - -	25?	E.
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## ASPERUGO

procumbens	- w e	s m n	c - -	1 2 3 - - -	6	L. s.
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## CYNOGLOSSUM

officinale	i w e	s m n	c a -	1 2 - - - -	60	E. s.
sylvaticum	i w e	s - -	c - -	1 - - - - -	7	G. e.

## PULMONARIA

angustifolia	- - e	s - -	c - -	1 - - - - -	2	E.
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## ECHIUM

vulgare	i w e	s m n	c - -	1 2 3 - - -	76	B. e.
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57. *Pinguiculaeæ*. Species 6. Census 206.

## PINGUICULA

vulgaris	i w e	s m n	c a u	1 2 3 4 5 -	71	S. b.
alpina	- w -	- - n	c - -	- - 3 - - -	2	S.
lusitanica	i w e	s m n	c a -	1 2 3 - - -	20	A. s.

## UTRICULARIA

vulgaris	i w e	s m n	c a -	1 2 3 - - -	57	B.
intermedia	i w e	s m n	c - -	1 2 3 - - -	10	L. s.
minor	i w e	s m n	c a -	1 2 3 - - -	46	B.

58. *Primulaceæ*. Species 17. Census 814. (*Dubious* 2—112).

## PRIMULA

vulgaris	i w e	s m n	c a -	1 2 3 ? - -	89	B.
elatior	- - e	s - -	c - -	1 - - - - -	2	G.
veris	i w e	s m n	c a -	1 2 3 - - -	75	B. e.
farinosa	- w e	- m -	c a -	- 2 3 4 - -	10	I.
scotica	- w -	- - n	c - -	- - 3 - - -	3	S.

## TRIENTALIS

europæa	- w e	- m n	c a u	- - 3 4 5 -	25	S. h.
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## HOTTONIA

palustris	i	w	e	-	s	m	-	c	-	-	1	2	-	-	-	-	41	E. g.
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## LYSIMACHIA

vulgaris	i	w	e		s	m	n	c	-	-	1	2	?	-	-	-	65	E. b.
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thyrsiflora	-	w	e		-	m	n	c	-	-	-	2	3	-	-	-	9	I. s.
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nummularia	i	w	e		s	m	-	c	-	-	1	2	-	-	-	-	53	E.
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nemorum	i	w	e		s	m	n	c	a	u	1	2	3	4	5	-	82	B.
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## ANAGALLIS

arvensis	i	w	e		s	m	n	c	a	-	1	2	?	-	-	-	77	B. e.
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cærulea	i	w	e		s	m	-	c	-	-	1	2	-	-	-	-	35	E.
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tenella	i	w	e		s	m	n	c	a	-	1	2	3	-	-	-	80	B.
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## CENTUNCULUS

minimus	i	w	e		s	m	n	c	-	-	1	2	3	-	-	-	37	E. b.
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## SAMOLUS

Valerandi	i	w	e		s	m	n	c	-	-	1	2	3	-	-	-	66	E. b.
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## GLAUX

maritima	i	w	e		s	m	n	c	-	-	1	2	3	-	-	-	65	B.
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59. *Plumbaginaceæ*. Species 6. Census 126.

## ARMERIA

maritima	i	w	e		s	m	n	c	a	u	1	2	3	4	5	6	65	B.
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## STATICE

Limonium	i	w	e		s	m	-	c	-	-	1	2	-	-	-	-	29	E.
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Bahusiensis	i	w	e		s	m	-	c	-	-	1	2	-	-	-	-	14	E.
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occidentalis	-	w	e		s	m	-	c	-	-	1	2	-	-	-	-	7	A. e.
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Dodartii	i	w	e		s	m	-	c	-	-	1	2	-	-	-	-	8	A. e.
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caspia	-	-	e		s	-	-	c	-	-	1	-	-	-	-	-	3	G.
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60. *Plantaginaceæ*. Species 6. Census 466.

## PLANTAGO

major	i	w	e		s	m	n	c	a	-	1	2	3	-	-	-	95	B.
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media	i	w	e		s	m	n	c	a	-	1	2	3	-	-	-	61	E. b.
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lanceolata	i	w	e		s	m	n	c	a	-	1	2	3	4	-	-	99	B.
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maritima	i	w	e		s	m	n	c	a	-	1	2	3	4	-	-	71	B.
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Coronopus	i	w	e		s	m	n	c	a	-	1	2	3	-	-	-	78	B.
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## LITTORELLA

lacustris	i	w	e		s	m	n	c	a	-	1	2	3	-	-	-	62	B.
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62. *Chenopodiaceæ*. Species 24. Census 796. (*Dubious* 2—98).

## CHENOPODIUM

olidum	i	w	e		s	m	-	c	-	-	1	2	-	-	-	-	29	G. e.
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polyspermum	i	w	e		s	m	-	c	-	-	1	2	-	-	-	-	34	E.
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## CHENOPODIUM

urbicum	i w e	s m -	c - -	1 2 - - - -	20	G. e.
rubrum	i w e	s m n	c - -	1 2 - - - -	49	E. g.
botryodes	- - e	s - -	c - -	1 - - - - -	2	G.
murale	i w e	s - -	c - -	1 2 - - - -	32	E. g.
hybridum	? w e	s - -	c - -	1 - - - - -	18	E.
album	i w e	s m n	c a -	1 2 3 - - -	85	B.
ficifolium	i w e	s m -	c - -	1 2 - - - -	13	G.
glaucum	- - e	s m -	c a -	1 2 - - - -	6	G.
B. Henricus	i w e	s m n	c a -	1 2 3 - - -	64	B. e.

## ATRIPLEX

portulacoides	i w e	s m -	c - -	1 2 - - - -	25	E.
pedunculata	i - e	s m -	c - -	1 - - - - -	7	G.
arenaria	i w e	s m n	c - -	1 2 3 - - -	9	L. b.
Babingtonii	i w e	s m n	c - -	1 2 3 - - -	46	B.
hastata	i w e	s m n	c a -	1 2 3 - - -	74	B.
angustifolia	i w e	s m n	c a -	1 2 3 - - -	64	B.
littoralis	i w e	s m n	c - -	1 2 - - - -	32	B.

## BETA

maritima	i w e	s m n	c - -	1 2 3 - - -	32	B. e.
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## SALSOLA

Kali	i w e	s m n	c - -	1 2 3 - - -	43	B. e.
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## SCHOBERIA

maritima	i w e	s m n	c - -	1 2 3 - - -	49	B.
fruticosa	- w e	s - -	c - -	1 - - - - -	7	G.

## SALICORNIA

herbacea	i w e	s m n	c - -	1 2 3 - - -	49	B.
radicans	i w e	s m -	c - -	1 2 - - - -	7	G.

63. *Polygonacea*. Species 26. Census 1353. (*Dubious* 3—128).

## POLYGONUM

Bistorta	i w e	s m n	c a -	1 2 3 - - -	62	B. i.
viviparum	i w e	s m n	c a u	- ? 3 4 5 6	25	H.
amphibium	i w e	s m n	c - -	1 2 3 - - -	89	B.
lapathifolium	i w e	s m n	c a -	1 2 3 - - -	69	B. e.
Persicaria	i w e	s m n	c a -	1 2 3 - - -	87	B.
mite	- w e	s m -	c - -	1 2 - - - -	8	G.
Hydropiper	i w e	s m n	c a -	1 2 3 - - -	81	B.
minus	i w e	s m -	c - -	1 2 - - - -	32	E. g.
aviculare	i w e	s m n	c a -	1 2 3 - - -	94	B.

## POLYGONUM

maritimum	- - e	s - -	c - -	1 - - - -	1	E.
Raii	i w e	s m n	c - -	1 2 3 - - -	27	B.
Convolvulus	i w e	s m n	ca -	1 2 3 - - -	88	B.
dumetorum	- w e	s - -	c - -	1 - - - -	6	E. g.

## RUMEX

Hydrolapathum	i w e	s m n	c - -	1 2 - - - -	51	E.
crispus	i w e	s m n	ca -	1 2 3 - - -	88	B.
aquaticus	- w e	- m n	ca -	- 2 3 - - -	20	S.
pratensis	- w e	s m -	ca -	1 2 - - - -	20	E.
obtusifolius	i w e	s m n	ca -	1 2 3 - - -	88	B.
sanguineus	i w e	s m n	ca -	1 2 3 - - -	68	B. e.
conglomeratus	i w e	s m n	c - -	1 2 3 - - -	66	B.
pulcher	i w e	s m -	c - -	1 - - - -	34	E.
maritimus	i w e	s m -	c - -	1 2 - - - -	23	E.
palustris	i w e	s m -	c - -	1 2 - - - -	22	E.
Acetosa	i w e	s m u	ca u	1 2 3 4 5 6	95	B.
Acetosella	i w e	s m n	ca ?	1 2 3 4 5 -	91	B.

## OXYRIA

reniformis	i w e	s m n	ca u	- - 3 4 5 6	18	H.
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64. *Eleagnaceæ*. *Species* 1. *Census* 5.

## HIPPHOPHAE

rhamnoides	- - e	s m -	c - -	1 ? - - - -	5	G.
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65. *Thymelæaceæ*. *Species* 2. *Census* 57. (*Dubious* 1—12).

## DAPHNE

Laureola	- w e	s m -	c - -	1 2 - - - -	45	E. g.
Mezereum	- w e	s m -	ca -	1 2 - - - -	12	E. g.

66. *Santalaceæ*. *Species* 1. *Census* 19.

## THESIUM

humifusum	- w e	s - -	c - -	1 - - - -	19	E. g.
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67. *Asuraceæ*. *Species* 1. *Census* 6. (*Dubious* 1—6).

## ASARUM

europæum	- w e	s m -	c - -	1 2 - - - -	6	E. i.
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68. *Empetraceæ*. *Species* 1. *Census* 54.

## EMPETRUM

nigrum	i w e	s m n	ca u	- 2 3 4 5 6	54	S. h.
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69. *Euphorbiaceæ*. *Species* 14. *Census* 478. (*Dubious* 6—294).

## EUPHORBIA

Peplis	i w e	s - -	c - -	1 - - - -	10	A.
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## EUPHORBIA

helioscopea	i w e	s m n	c a -	1 2 3 - - -	90	B.
platyphylla	- w e	s m -	c - -	1 - - - - -	26	E.
stricta	- w e	s - -	c - -	1 - - - - -	3	E.
hiberna	i w -	s - -	c - -	1 - - - - -	1	A.
pilosa	- w -	s - -	c - -	1 - - - - -	1	A.
Paralias	i w e	s m -	c - -	1 2 - - - -	25	A. e.
portlandica	i w e	s m -	c - -	1 2 - - - -	16	A.
exigua	i w e	s m n	c a -	1 2 - - - -	65	E. b.
Peplus	i w e	s m n	c a -	1 2 3 - - -	79	B. e.
amygdaloides	i w e	s m -	c - -	1 2 - - - -	44	E.

## BUXUS

sempervirens	- - e	s - -	c - -	1 - - - - -	4	G.
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## MERCURIALIS

perennis	i w e	s m n	c a -	1 2 3 4 - -	84	B.
annua	i w e	s m -	c - -	1 2 - - - -	30	E.

70. *Urticaceæ*. Species 4. Census 309. (Dubious 1—54).

## URTICA

urens	i w e	s m n	c a -	1 2 3 - - -	86	B.
dioica	i w e	s m n	c a u	1 2 3 4 5 -	94	B.

## PARIETARIA

officinalis	i w e	s m n	c a -	1 2 3 - - -	75	B. e.
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## HUMULUS

Lupulus	i w e	s m -	c a -	1 2 - - - -	54	E.
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70\*. *Ulmaceæ*. Species 2. Census 73.

## ULMUS

montana	i w e	s m n	c a -	1 2 3 - - -	50	B.
suberosa	i w e	s m -	c - -	1 2 - - - -	23	E.

71. *Amentifera*. Species 34. Census 1239.

## QUERCUS

Robur	i w e	s m n	c a -	1 2 3 - - -	80	B.
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## FAGUS

sylvatica	i w e	s m -	c - -	1 2 - - - -	30	E.
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## CARPINUS

Betulus	i w e	s m -	c - -	1 - - - - -	20	E. g.
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## CORYLUS

Avellana	i w e	s m n	c a -	1 2 3 - - -	91	B.
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## ALNUS

glutinosa	i w e	s m n	c a -	1 2 3 - - -	86	B.
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## BETULA

alba	i w e	s m n	c a ?	1 2 3 4 5 -	81	B.
nana	- w e	- m n	- a u	- - - 4 5 -	10	H.

## POPULUS

alba	i w e	s m -	c - -	1 2 - - - -	26	E.
tremula	i w e	s m n	c a -	1 2 3 ? - -	60	B.

## SALIX

pentandra	i w e	s m n	c a -	1 2 3 - - -	34	S. i.
fragilis	i w e	s m n	c - -	1 2 3 - - -	44	B. e.
alba	i w e	s m n	c - -	1 2 ? - - -	47	B. e.
triandra	i w e	s m n	c - -	1 2 - - - -	40	E. b.
acutifolia	- - e	- m -	c - -	- 2 - - - -	1	L. i.
purpurea	i w e	s m n	c a -	1 2 - - - -	42	B. e.
rubra	i w e	s m n	c - -	1 2 - - - -	22	E. i.
viminialis	i w e	s m n	c - -	1 2 3 - - -	53	B. e.
Smithiana	i w e	s m n	c - -	1 2 - - - -	36	E. b.
cinerea	i w e	s m n	c a -	1 2 3 - - -	74	B.
aurita	i w e	s m n	c a -	1 2 3 4 - -	61	B.
caprea	i w e	s m n	c a -	1 2 3 4 - -	72	B. e.
nigricans	i w e	- m n	c a ?	- 2 3 4 5 -	16	S. h.
laurina	i w e	- m n	c a -	- 2 3 - - -	4	I.
phylicifolia	i w e	- m n	c a ?	- 2 3 4 5 -	17	S. h.
ambigua	i w e	s m n	c a -	1 2 3 - - -	7	S. ?
repens	i w e	s m n	c a -	1 2 3 4 - -	70	B.
arbuscula	- w e	- - n	- a u	- - - 4 5 -	4	H.
Lapponum	i w e	- m n	- a u	- - 3 4 5 -	12	H.
lanata	- - e	- - n	- - u	- - - - 5 -	2	H.
procumbens	- w e	- - n	- - u	- - - - 5 -	4	H.
Myrsinites	i w e	- - n	- - u	- - - - 5 -	4	H.
reticulata	- w e	- - n	- - u	- - - - 5 6	4	H.
herbacea	i w e	s m n	- a u	- - - - 5 6	23	H.

## MYRICA

Gale	i w e	s m n	c a -	1 2 3 4 - -	62	B.
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72. *Coniferae*. Species 4. Census 112.

## PINUS

sylvestris	i w e	? ? n	c a u	- - 3 4 - -	9	S.
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## JUNIPERUS

communis	i w e	s m n	c a u	1 2 3 4 5 -	57	B.
nana	i w e	s m n	- a u	- - - 4 5 -	13	H.

## TAXUS

baccata	i w e	s m -	c a -	1 2 3 - - -	33	E.
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73. *Orchidaceæ*. Species 39. Census 1251.

## GOODYERA

repens	- w e	- - n	c - -	- 2 3 - - -	9	S.
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## SPIRANTHES

autumnalis	i w e	s m -	c - -	1 2 - - - -	55	E.
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æstivalis	- w e	s - -	c - -	1 - - - - -	2	E.
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## NEOTTIA

Nidus-avis	i w e	s m n	c - -	1 2 3 - - -	56	B. e.
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## LISTERA

cordata	i w e	s m n	c a u	- 2 3 4 5 -	44	S. h.
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ovata	i w e	s m n	c a -	1 2 3 - - -	77	B.
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## EPIPACTIS

latifolia	i w e	s m n	c a -	1 2 3 - - -	62	B. e.
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media	i w e	s m -	c - -	1 2 - - - -	16	E. g.
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atrorubens	- w e	s m n	c a -	1 2 3 - - -	6	L. i.
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palustris	i w e	s m n	c a -	1 2 3 - - -	44	E. b.
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## CEPHALANTHERA

grandiflora	i w e	s m -	c - -	1 2 - - - -	24	E.
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ensifolia	i w e	s m n	c - -	1 2 - - - -	20	E. i.
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rubra	- w ?	s - -	c - -	1 - - - - -	3	E.
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## EPIPOGIUM

aphyllum	- w -	s - -	c - -	1 - - - - -	1	L. e.
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## CORALLORHIZA

innata	- w e	- m n	c - -	- 2 3 - - -	9	S.
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## ORCHIS

Morio	i w e	s m -	c - -	1 2 - - - -	49	E.
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mascula	i w e	s m -	c a -	1 2 3 - - -	73	B.
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ustulata	- w e	s m -	c - -	1 2 - - - -	31	G. e.
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militaris	- - e	s - -	c - -	1 - - - - -	4	G.
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tephrosanthos	- - e	s - -	c - -	1 - - - - -	2	G.
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fusca	? - e	s - -	c - -	1 - - - - -	2	G.
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hircina	- - e	s - -	c - -	1 - - - - -	2	G.
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pyramidalis	i w e	s m -	c - -	1 2 - - - -	47	G. e.
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latifolia	i w e	s m n	c a -	1 2 3 - - -	77	B.
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maculata	i w e	s m n	c a u	1 2 3 4 5 -	88	B.
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## GYMNADENIA

Conopsea	i w e	s m n	c a -	1 2 3 4 - -	77	B.
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## GYMNADENIA

bifolia	i w e	s m n	c a -	1 2 3 - - -	75	B.
chlorantha	i w e	s m n	c - -	1 2 3 - - -	40	E. b.

## HABENARIA

viridis	i w e	s m n	c a u	1 2 3 4 5 -	71	B. s.
albida	i w e	s m n	c a -	1 2 3 4 - -	37	S.

## ACERAS

anthropophora	- - e	s m -	c - -	1 - - - - -	12	G.
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## HERMINIUM

Monorchis	- w e	s - -	c - -	1 - - - - -	17	G. e.
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## OPHRYS

apifera	i w e	s m -	c a -	1 2 - - - -	46	E. g.
arachnites	- - e	s - -	c - -	1 - - - - -	1	G.
aranifera	- ? e	s - -	c - -	1 - - - - -	7	G.
muscifera	i w e	s m -	c a -	1 2 - - - -	35	E. g.

## MALAXIS

paludosa	i w e	s m n	c a -	1 2 3 - - -	23	B. ?
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## LIPARIS

Loeselii	- - e	s - -	c - -	1 - - - - -	4	G.
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## CYPRIPEDIUM

Calceolus	- - e	- m -	c a -	- 2 - - - -	3	I.
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74. *Iridaceæ*. Species 4. Census 141. (*Dubious* 1—6).

## IRIS

foetidissima	i w e	s m -	c - -	1 2 - - - -	39	E.
Pseudacorus	i w e	s m n	c - -	1 2 3 - - -	95	B.

## TRICHONEMA

Columnæ	- w -	s - -	c - -	1 - - - - -	1	A.
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## CROCUS

nudiflorus	- w e	s m -	c - -	1 2 - - - -	6	I.
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75. *Amaryllidaceæ*. Species 2. Census 49. (*Dubious* 1—6).

## NARCISSUS

Pseudo-Narciss.	i w e	s m -	c - -	1 2 - - - -	43	E.
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## LEUCOJUM

æstivum	- w e	s - -	c - -	1 - - - - -	6	G. e.
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76. *Liliaceæ*. Species 21. Census 450. (*Dubious* 3—22).

## FRITILLARIA

Meleagris	- w e	s - -	c - -	1 - - - - -	18	E.
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## ALLIUM

Scorodoprasum	i w e	- m n	c - -	- 2 - - - -	13	I. s.
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## ALLIUM

oleraceum	i w e	s m n	c a -	1 2 - - -	26	G. e.
vineale	i w e	s m n	c - -	1 2 - - -	58	E. b.
sphærocephalm.	- w -	s - -	c - -	1 - - - -	1	L. a.
Schœnoprasum	- w e	s m -	c - -	1 2 - - -	4	L. i.
ursinum	i w e	s m n	c a -	1 2 3 - -	75	B. e.

## GAGEA

lutea	- w e	s m n	c - -	1 2 - - -	23	I. b.
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## ORNITHOGALUM

pyrenaicum	- w e	s - -	c - -	1 - - - -	8	E.
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## SCILLA

verna	i w e	s m n	c a -	1 2 3 - -	21	A. b.
autumnalis	- w e	s - -	c - -	1 - - - -	7	E.

## HYACINTHUS

nonscriptus	i w e	s m n	c a -	1 2 3 - -	76	B.
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## MUSCARI

racemosum	- - e	s - -	c - -	1 - - - -	3	G.
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## LLOYDIA

serotina	- w -	s - -	- ? -	- - - 4 - -	1	L. ?
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## SIMETHIS

bicolor	- w -	s - -	c - -	1 - - - -	1	L. a.
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## ASPARAGUS

officinalis	i w e	s - -	c - -	1 - - - -	9	A.
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## RUSCUS

aculeatus	- w e	s m -	c - -	1 2 - - -	24	G. e.
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## CONVALLARIA

majalis	i w e	s m n	c a -	1 2 3 - -	47	G. b.
verticillata	- - e	- m n	- ? -	- - 3 - -	2	S.
multiflora	- w e	s m -	c - -	1 2 - - -	25	E. g.
Polygonatum	- w e	s m -	c a -	1 2 3 - -	8	E. a.

76\*. *Trilliaceæ*. Species 1. Census 59.

## PARIS

quadrifolia	i w e	s m n	c a -	1 2 3 - -	59	B. e.
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77. *Tamaceæ*. Species 1. Census 63.

## TAMUS

communis	- w e	s m -	c a -	1 2 - - -	63	E.
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78. *Melanthiaceæ*. Species 3. Census 123.

## COLCHICUM

autumnale	i w e	s m -	c - -	1 2 - - -	31	E.
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## TOFIELDIA

palustris	- w e	- m n	- a u	- - 3 4 5 -	12	H.
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## NARTHECIUM

ossifragum	i w e	s m n	c a u	1 2 3 4 5 6	80	B.
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79. *Hydrocharidaceæ*. Species 2. Census 50. (Dubious 1—14).

## HYDROCHARIS

Morsus-ranæ	i w e	s m -	c - -	1 2 - - - -	36	E. g.
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## STRATIOTES

aloides	i w e	s m -	c - -	1 2 - - - -	14	G.
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80. *Allismaceæ*. Species 9. Census 414.

## ALISMA

Plantago	i w e	s m n	c - -	1 2 3 - - -	85	B.
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ranunculoides	i w e	s m n	c - -	1 2 3 - - -	67	B.
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natans	i w e	s m -	c - -	1 2 - - - -	7	L. a.
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## ACTINOCARPUS

Damasonium	- w e	s m -	c - -	1 - - - - -	11	G.
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## SAGITTARIA

sagittifolia	i w e	s m -	c - -	1 2 - - - -	49	E.
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## BUTOMUS

umbellatus	i w e	s m -	c - -	1 2 - - - -	47	E.
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## TRIGLOCHIN

maritimum	i w e	s m n	c - -	1 2 3 - - -	59	B.
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palustre	i w e	s m n	c a u	1 2 3 4 5 -	83	B.
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## SCHEUCHZERIA

palustris	- w e	s m n	c - -	1 2 - - - -	6	I.
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81. *Potamaceæ*. Species 22. Census 727.

## POTAMOGETON

densus	i w e	s m -	c a -	1 2 3 - - -	44	E.
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flabellatus	- w e	s m ?	c - -	1 2 - - - -	16	E. ?
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pectinatus	i w e	s m n	c - -	1 2 - - - -	52	B.
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filiformis	- w e	s m n	c - -	1 2 3 - - -	11	B. ?
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pusillus	i w e	s m n	c - -	1 2 3 - - -	58	B.
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gracilis ?	- - e	- m -	c - -	- 2 - - - -	1	L. g.
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trichoides	- - e	s - -	c - -	1 - - - - -	1	L. i.
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compressus	i w e	s m -	c - -	1 2 - - - -	17	E. g.
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gramineus	i w e	s m n	c - -	1 2 - - - -	30	E. b.
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acutifolius	i - e	s - -	c - -	1 - - - - -	3	G.
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zosteræfolius	- w e	s m n	c - -	1 2 - - - -	10	E. ?
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crispus	i w e	s m n	c - -	1 2 3 - - -	64	B. e.
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## POTAMOGETON

perfoliatus	i w e	s m n	c a -	1 2 3 - - -	54	B.
lucens	i w e	s m n	c a -	1 2 3 - - -	45	E. b.
prælongus	i w e	s m n	c a -	1 2 3 - - -	15	S. i.
heterophyllus	i w e	s m n	c a -	1 2 3 - - -	42	B. e.
rufescens	i w e	s m n	c - -	1 2 3 - - -	29	B. ?
natans	i w e	s m n	c ? -	1 2 3 - - -	78	B. ?
oblongus	i w e	s m n	c a -	1 2 3 4 - -	53	B.
plantagineus	i w e	s m n	c - -	1 2 3 - - -	16	E. g.

## RUPPIA

maritima	i w e	s m n	c - -	1 2 3 - - -	36	B.
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## ZANNICHELLIA

palustris	i w e	s m n	c - -	1 2 3 - - -	52	B.
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81.\* *Zosteraceæ*. *Species* 2. *Census* 49.

## ZOSTERA

marina	i w e	s m n	c - -	1 2 3 - - -	43	B.
nana	- w e	s m -	c - -	1 2 - - - -	6	E. ?

82. *Pistiaceæ*. *Species* 4. *Census* 200.

## LEMNA

minor	i w e	s m n	c a -	1 2 3 - - -	81	B.
gibba	i w e	s m -	c - -	1 2 - - - -	32	E. g.
polyrhiza	i w e	s m -	c - -	1 2 - - - -	38	E. g.
trisulca	i w e	s m n	c - -	1 2 - - - -	49	E. b.

82.\* *Araceæ*. *Species* 2. *Census* 86.

## ARUM

maculatum	i w e	s m -	c a -	1 2 - - - -	61	E.
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## ACORUS

Calamus	- w e	s m -	c a -	1 2 - - - -	25	E.
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82.\* *Typhaceæ*. *Species* 6. *Census* 314.

## SPARGANIUM

minimum	i w e	s m n	c a -	1 2 3 - - -	30	B. s.
natans	i w e	s m n	c a -	1 2 3 - - -	30	B.
simplex	i w e	s m n	c - -	1 2 3 - - -	70	B. e.
ramosum	i w e	s m n	c a -	1 2 3 - - -	79	B.

## TYPHA

latifolia	i w e	s m n	c - -	1 2 3 - - -	64	B. e.
angustifolia	i w e	s m n	c - -	1 2 - - - -	41	E.

83. *Restiacea*. Species 1. Census 2.

## ERIOCAULON

septangulare	i w -	- - n	c - -	- - 3 - - -	2	S. a.
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84. *Juncaceæ*. Species 26. Census 1200.

## JUNCUS

filiformis	- w e	- m n	c - -	- 2 3 - - -	2	I. s.
conglomeratus	i w e	s m n	c a -	1 2 3 - - -	85	B.
effusus	i w e	s m n	c a u	1 2 3 4 - -	92	B.
diffusus	- w e	s m ?	c - -	1 2 - - - -	17	E.
glaucus	i w e	s m n	c a -	1 2 3 - - -	67	E. b.
balticus	- w e	- - n	c - -	- 2 3 - - -	7	S.
maritimus	i w e	s m n	c - -	1 2 3 - - -	43	B. e.
acutus	i w e	s m -	c - -	1 - - - - -	12	E. a.
acutiflorus	i w e	s m n	c a -	1 2 3 - - -	83	B.
lamprocarpus	i w e	s m n	c a u	1 2 3 4 5 -	84	B.
obtusiflorus	i w e	s m -	c - -	1 2 - - - -	35	E. g.
supinus	i w e	s m n	c a u	1 2 3 4 5 -	76	B.
compressus	i w e	s m n	c - -	1 2 3 - - -	54	B.
bufonius	i w e	s m n	c a -	1 2 3 - - -	90	B.
squarrosus	i w e	s m n	c a u	1 2 3 4 5 6	71	B.
castaneus	- w e	- - n	- - u	- - - - 5 6	4	H.
trifidus	- w e	- - n	- a u	- - - - 5 6	11	H.
biglumis	- - e	- - n	- - u	- - - - 6	4	H.
triglumis	- w e	s m n	- a u	- - ? 4 5 6	17	H.

## LUZULA

sylvatica	i w e	s m n	c a u	1 2 3 4 5 ?	78	B.
pilosa	i w e	s m n	c a -	1 2 3 - - -	78	B.
Forsteri	- w e	s - -	c - -	1 - - - - -	21	E.
campestris	i w e	s m n	c a u	1 2 3 4 5 -	86	B.
multiflora	i w e	s m n	c a u	1 2 3 4 5 -	67	B.
arcuata	- w e	- - n	- - u	- - - - 6	2	H.
spicata	- w e	s m n	- a u	- - - 4 5 6	14	H.

85. *Cyperaceæ*. Species 93. Census 3402.

## CYPERUS

longus	- w e	s - -	c - -	1 - - - - -	7	A. e.
fuscus	- - e	s m -	c ? -	1 2 - - - -	3	G.

## CLADIUM

Mariscus	i w e	s m n	c - -	1 2 3 - - -	26	E. b.
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## SCHÆNUS

nigricans	i w e	s m n	c a -	1 2 3 - - -	49	B.
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## RHYNCOSPORA

alba	i w e	s m n	c - -	1 2 3 - - -	54	B.
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fusca	i w -	s - -	c - -	1 - - - - -	4	A.
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## BLYSMUS

compressus	- w e	s m -	c a -	1 2 3 - - -	37	E.
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rufus	i w e	- m n	c - -	1 2 3 - - -	27	S.
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## SCIRPUS

lacustris	i w e	s m n	c a -	1 2 3 - - -	71	B.
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glaucus	i w e	s m n	c - -	1 2 - - - -	26	E. b.
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carinatus	- - e	s - -	c - -	1 - - - - -	4	G.
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triqueter	- - e	s - -	c - -	1 - - - - -	3	G.
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setaceus	i w e	s m n	c a -	1 2 3 - - -	77	B.
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Savii	i w e	s m n	c - -	1 2 - - - -	20	A.
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Holoschœnus	- w -	s - -	c - -	1 - - - - -	1	A.
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maritimus	i w e	s m n	c - -	1 2 3 - - -	57	B. e.
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sylvaticus	i w e	s m n	c - -	1 2 3 - - -	63	B. e.
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palustris	i w e	s m n	c a -	1 2 3 - - -	79	B.
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uniglumis	- w e	s m n	c a -	1 2 3 - - -	11	S. ?
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multicaulis	i w e	s m n	c ? -	1 2 3 - - -	44	B.
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pauciflorus	i w e	s m n	c a -	1 2 3 - - -	50	B.
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cæspitosus	i w e	s m n	c a u	1 2 3 4 5 6	67	B. s.
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acicularis	i w e	s m n	c - -	1 2 - - - -	46	E. b.
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fluitans	i w e	s m n	c a -	1 2 3 - - -	53	B.
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## ERIOPHORUM

vaginatum	i w e	s m n	c a u	1 2 3 4 5 -	66	B. s.
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angustifolium	i w e	s m n	c a u	1 2 3 4 5 6	85	B.
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latifolium	i w e	s m n	c a -	1 2 3 - - -	29	B.
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gracile	- - e	s m -	c - -	1 2 - - - -	2	L. e.
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## ELYNA

caricina	- w e	- m n	- a u	- - 3 4 5 -	4	I.
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## CAREX

dioica	i w e	s m n	c a u	1 2 3 4 5 -	54	S. b.
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pulcaris	i w e	s m n	c a u	1 2 3 4 5 -	74	B.
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pauciflora	- w e	- m n	- a u	- - 3 4 5 -	18	H.
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rupestris	- w e	- - n	- - u	- - - 4 5 -	4	H.
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incurva	- w e	- m n	c - -	- 2 3 - - -	13	S.
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stellulata	i w e	s m n	c a u	1 2 3 4 5 -	77	B.
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## CAREX

"leporina"	- - e	- - n	- - u	- - - - - 6	1	H.
ovalis	i w e	s m n	c a -	1 2 3 4 - -	76	B.
curta	i w e	s m n	c a ?	1 2 3 4 5 -	46	B.
Persoonii	- w e	s m n	- a u	- - 3 4 5 -	8	H.
elongata	i w e	s m -	c - -	1 2 - - - -	9	E. i.
remota	i w e	s m n	c a -	1 2 3 - - -	67	B. e.
axillaris	i w e	s m -	c - -	1 2 - - - -	21	E. g.
Boenninghaus.	- - e	s m n	c - -	1 2 3 - - -	8	G. ?
intermedia	i w e	s m n	c a -	1 2 3 - - -	52	E. h.
arenaria	i w e	s m n	c - -	1 2 3 - - -	53	B.
divisa	? w e	s m -	c - -	1 - - - - -	20	E.
muricata	i w e	s m n	c a -	1 2 3 - - -	57	B. e.
divulsa	i w e	s m -	c - -	1 2 - - - -	35	E. g.
vulpina	i w e	s m n	c - -	1 2 3 - - -	66	B.
teretiuscula	i w e	s m n	c a -	1 2 3 - - -	32	B. e.
paradoxa	i - e	- m -	c - -	- 2 - - - -	2	L. i.
paniculata	i w e	s m n	c a -	1 2 3 - - -	59	B.
VahlII	- - e	- - n	- - u	- - - - 5 -	1	H.
atrata	- w e	s m n	- - u	- - - - 5 6	5	H.
vulgaris	i w e	s m n	c a u	1 2 3 4 5 -	80	B.
rigida	i w e	s m n	- a u	- - - - 5 6	20	H.
aquatilis	- - e	- - n	- a u	- - 3 ? 5 -	2	H.
stricta	i w e	s m -	c - -	1 2 - - - -	21	E. i.
acuta	i w e	s m n	c - -	1 2 3 - - -	44	B. e.
pulla	- w e	- - n	- - u	- - - - 5 6	11	H.
flava	i w e	s m n	c a u	1 2 3 4 5 -	79	B.
Æderi	i w e	s m n	c a u	1 2 3 4 5 -	51	B.
extensa	i w e	s m n	c - -	1 2 3 - - -	35	B.
pallescent	i w e	s m n	c a -	1 2 3 4 - -	56	B.
fulva	i w e	s m n	c a -	1 2 3 4 - -	62	B.
distans	i w e	s m n	c - -	1 2 3 - - -	39	B.
punctata ?	- w -	s - -	c - -	1 - - - - -	2	L. ?
binervis	i w e	s m n	c a u	1 2 3 4 5 -	71	B.
lævigata	i w e	s m n	c - -	1 2 3 - - -	34	B. l.
panicea	i w e	s m n	c a u	1 2 3 4 5 -	81	B.
vaginata	- w e	- - n	- - u	- - - - 5 6	6	H.
depauperata	- - e	s - -	c - -	1 - - - - -	2	G.
capillaris	- w e	- m n	c a u	- - 3 4 5 -	9	H.

## CAREX

limosa	i w e	s m n	c ? -	1 2 3 - - -	25	S.
irrigua	- w e	- m n	c - -	- 2 3 - - -	8	S. i.
rariflora	- w e	- - n	- ? u	- - - - 5 -	2	H.
strigosa	i w e	s m -	c - -	1 2 - - - -	28	E.
sylvatica	i w e	s m n	c a u	1 2 3 4 5 -	67	B. e.
pendula	i w e	s m n	c - -	1 2 3 - - -	54	B. e.
Ps. Cyperus	i w e	s m -	c - -	1 2 3 - - -	37	E.
glauca	i w e	s m n	c a u	1 2 3 4 - -	84	B.
præcox	i w e	s m n	c a u	1 2 3 4 5 -	67	B.
montana	- w e	s - -	c - -	1 - - - - -	4	E.
pilulifera	i w e	s m n	c a u	1 2 3 4 5 6	63	B. e.
tomentosa	- w -	s - -	c - -	1 - - - - -	1	L. e.
clandestina	- w -	s - -	c - -	1 - - - - -	4	L. e.
digitata	- w e	s m -	c a -	1 2 - - - -	9	E.
filiformis	i w e	s m n	c - -	1 2 3 - - -	25	S. b.
hirta	i w e	s m n	c a -	1 2 3 - - -	63	B. e.
ampullacea	i w e	s m n	c a u	1 2 3 4 5 -	72	B.
vesicaria	i w e	s m n	c a -	1 2 3 - - -	53	B. e.
paludosa	i w e	s m n	c - -	1 2 3 - - -	54	B.
riparia	i w e	s m n	c - -	1 2 3 - - -	55	B. e.

86. *Gramina.* Species 112. Census 5007. (*Dubious* 10—245).

## LEERSIA

oryzoides	- - e	s - -	c - -	1 - - - - -	3	E. g.
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## SPARTINA

stricta	- w e	s m -	c - -	1 - - - - -	9	G.
alterniflora	- - e	s - -	c - -	1 - - - - -	1	E. g.

## CYNODON

Dactylon	- w -	s - -	c - -	1 - - - - -	2	A.
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## DIGITARIA

humifusa	- - e	s - -	c - -	1 - - - - -	4	G.
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## SETARIA

viridis	- - e	s - -	c - -	1 - - - - -	6	G.
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## PHALARIS

arundinacea	i w e	s m n	c a -	1 2 3 - - -	88	B.
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## ANTHOXANTHUM

odoratum	i w e	s m n	c a u	1 2 3 4 5 6	87	B.
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## HIEROCHLOE

borealis	- w ?	- - n	c - -	- - 3 - - -	1	S.
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## PHILEUM

alpinum	- - e	- - n	- - u	- - - - 5 6	2	H.
pratense	i w e	s m n	c a -	1 2 3 - - -	78	B. e.
arenarium	i w e	s m n	c - -	1 2 3 - - -	34	E. b.
asperum	- - e	s - -	c - -	1 - - - - -	?	E. ?
Boehmeri	- - e	s - -	c - -	1 - - - - -	4	G.

## ALOPECURUS

alpinus	- w e	- - n	- - u	- - - - 5 6	4	H.
pratensis	i w e	s m n	c a -	1 2 3 - - -	80	B.
geniculatus	i w e	s m n	c a -	1 2 3 - - -	84	B.
fulvus	- w e	s - -	c - -	1 - - - - -	11	E.
bulbosus	- w e	s - -	c - -	1 2 - - - -	11	E.
agrestis	i w e	s m -	c - -	1 2 - - - -	50	E.

## KNAPPIA

agrostidea	- w -	s - -	c - -	1 - - - - -	1	L. a.
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## GASTRIDIDIUM

lendigerum	- w e	s - -	c - -	1 - - - - -	18	E.
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## POLYPOGON

littoralis	- w e	s - -	c - -	1 - - - - -	5	G.
monspeliensis	- w e	s - -	c - -	1 - - - - -	6	G. e.

## MILIUM

effusum	i w e	s m n	c a -	1 2 3 - - -	54	B. e.
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## APERA

Spica-venti	- - e	s m -	c - -	1 2 - - - -	17	G.
interrupta	- - e	s - -	c - -	1 - - - - -	2	G.

## AGROSTIS

setacea	- w e	s - -	c - -	1 - - - - -	9	A.
canina	i w e	s m n	c a -	1 2 3 - - -	50	B.
vulgaris	i w e	s m n	c a -	1 2 3 4 5 -	91	B.
alba	i w e	s m n	c a u	1 2 3 - - -	85	B.

## AMMOPHILA

arundinacea	i w e	s m n	c - -	1 2 3 - - -	53	B.
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## ARUNDO

Phragmites	i w e	s m n	c a -	1 2 3 - - -	83	B.
Calamagrostis	- w e	s m -	c - -	1 2 - - - -	25	E.
Epigejos	i w e	s m n	c a -	1 2 3 - - -	45	E. b.
stricta	i w ?	- m ?	c - -	- 2 - - - -	1	L. i.

## SESLERIA

cærulea	i w e	- m n	- a u	- 2 3 4 5 -	9	H. i.
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## AIRA

cæspitosa	i w e	s m n	c a u	1 2 3 4 5 -	84	B.
alpina	- w e	- - n	- - u	- - - - 5 6	6	H.
flexuosa	i w e	s m n	c a u	1 2 3 4 5 6	75	B.
caryophyllea	i w e	s m n	c a -	1 2 3 - - -	76	B.
præcox	i w e	s m n	c a -	1 2 3 4 - -	80	B.
canescens	- w e	s - -	c - -	1 - - - - -	4	G.

## AVENA

fatua	i w e	s m n	c a -	1 2 - - - -	59	B. e.
pratensis	i w e	s m n	c a u	1 2 3 4 5 -	54	B.
pubescens	i w e	s m n	c a -	1 2 3 4 - -	62	B.
flavescens	i w e	s m n	c a -	1 2 - - - -	61	E. b.

## ARRHENATHERUM

avenaceum	i w e	s m n	c a -	1 2 3 - - -	89	B.
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## HOLCUS

lanatus	i w e	s m n	c a -	1 2 3 4 - -	94	B.
mollis	i w e	s m n	c a -	1 2 3 - - -	76	B.

## TRIODIA

decumbens	i w e	s m n	c a -	1 2 3 4 - -	77	B.
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## KOELERIA

cristata	i w e	s m n	c a -	1 2 3 - - -	56	B.
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## MELICA

uniflora	i w e	s m n	c a -	1 2 3 - - -	65	E. b.
nutans	- w e	s m n	c a -	1 2 3 - - -	28	S.

## MOLINIA

cærulea	i w e	s m n	c a u	1 2 3 4 5 -	80	B.
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## CATABROSA

aquatica	i w e	s m n	c a -	1 2 3 - - -	65	B.
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## GLYCERIA

aquatica	i w e	s m n	c - -	1 2 3 - - -	57	E. b.
fluitans	i w e	s m n	c a -	1 2 3 4 - -	88	B.
plicata	i w e	s m n	c a -	1 2 3 - - -	22	E. b.
maritima	i w e	s m n	c - -	1 2 3 - - -	47	B.
distanis	i w e	s m n	c - -	1 2 - - - -	38	E. b.
Borreri	- - e	s - -	c - -	1 - - - - -	5	G.
procumbens	i w e	s m -	c - -	1 2 - - - -	17	E. g.
rigida	i w e	s m n	c a -	1 2 3 - - -	61	B. e.
loliacea	i w e	s m n	c - -	1 2 - - - -	26	E.



## POA

annua	i w e	s m n	c a u	1 2 3 4 5 6	91	B.
bulbosa	- w e	s - -	c - -	1 - - - -	6	G.
alpina	i w e	s m n	- a u	- - - 4 5 6	12	H.
laxa	- w e	- - n	- - u	- - - - - 6	2	H.
minor	- w e	- - n	- - u	- - - - - 6	2	H.
pratensis	i w e	s m n	c a u	1 2 3 4 5 -	84	B.
trivialis	i w e	s m n	c a u	1 2 3 4 5 -	86	B.
compressa	i w e	s m n	c a -	1 2 3 - - -	54	B. e.
nemoralis	i w e	s m n	c a ?	1 2 3 4 ? -	50	B. e.
casia	- w e	s m n	- a u	- - - - 5 -	6	H.

## BRIZA

media	i w e	s m n	c a -	1 2 3 4 - -	76	B. e.
minor	- w e	s - -	c - -	1 - - - - -	6	A.

## CYNOSURUS

cristatus	i w e	s m n	c a -	1 2 3 - - -	91	B.
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## DACTYLIS

glomerata	i w e	s m n	c a -	1 2 3 - - -	91	B.
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## FESTUCA

uniglumis	i w e	s m -	c - -	1 2 - - - -	18	E.
bromoides	i w e	s m n	c a -	1 2 3 - - -	67	B.
Ps. myurus	i w e	s m -	c ? -	1 2 - - - -	30	E.
ovina	i w e	s m n	c a u	1 2 3 4 5 6	93	B.
duriuscula	i w e	s m n	c a u	1 2 3 4 5 -	69	B.
rubra	i w e	s m n	c - -	1 2 3 - - -	35	B.
sylvatica	i w e	s m n	c a -	1 2 3 - - -	14	S.
arundinacea	- w e	s ? ?	c - -	1 ? - - - -	2	E.
elatior	i w e	s m n	c a -	1 2 3 - - -	60	B.
pratensis	i w e	s m n	c a -	1 2 3 - - -	68	B.

## BROMUS

giganteus	i w e	s m n	c a -	1 2 3 - - -	71	B. e.
asper	i w e	s m n	c a -	1 2 3 - - -	75	B. e.
sterilis	i w e	s m n	c a -	1 2 3 - - -	67	B. e.
madritensis	- w e	s - -	c - -	1 - - - - -	8	A.
erectus	i w e	s m n	c - -	1 2 - - - -	32	G. e.
secalinus	i w e	s m n	c - -	1 2 3 - - -	49	B. e.
commutatus	i w e	s m n	c a -	1 2 3 - - -	61	B.
mollis	i w e	s m n	c a -	1 2 3 - - -	93	B.

## BRACHYPODIUM

sylvaticum	i w e	s m n	c a -	1 2 3 - - -	79	B.
pinatum	? w e	s m -	c - -	1 2 - - - -	32	G. e.

## TRITICUM

caninum	i w e	s m n	c a -	1 2 3 - - -	58	B.
repens	i w e	s m n	c a -	1 2 3 - - -	87	B.
laxum	- w e	s m n	c - -	1 2 ? - - -	30	B.
juncum	i w e	s m n	c - -	1 2 3 - - -	51	B.

## LOLIUM

perenne	i w e	s m n	c a -	1 2 3 - - -	93	B.
temulentum	i w e	s m n	c - -	1 2 3 - - -	51	B. e.

## ELYMUS

arenarius	i w e	s m n	c - -	1 2 3 - - -	23	S. b.
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## HORDEUM

sylvaticum	- w e	s m -	c - -	1 2 - - - -	22	G. e.
pratense	i w e	s m n	c - -	1 2 - - - -	52	E.
murinum	i w e	s m n	c - -	1 2 - - - -	64	E. b.
maritimum	i w e	s m -	c - -	1 2 - - - -	24	E. g.

## NARDUS

stricta	i w e	s m n	c a u	1 2 3 4 5 6	75	B.
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## LEPTURUS

filiformis	i w e	s m -	c - -	1 2 - - - -	34	E.
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87. *Filices.* Species 39. Census 1795

## CETERACH

officinatum	i w e	s m n	c a -	1 2 3 - - -	55	E.
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## WOODSIA

ilvensis	- w e	s m n	- a u	- - - 4 5 -	6	H.
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## POLYPODIUM

vulgare	i w e	s m n	c a u	1 2 3 4 - -	93	B.
Phegopteris	i w e	s m n	c a u	1 2 3 4 5 6	55	S. b.
Dryopteris	i w e	s m n	c a u	1 2 3 4 5 ?	54	S.
calcareum	- w e	s m -	c a -	1 2 3 - - -	15	E. i.

## ALLOSORUS

crispus	i w e	s m n	? a u	- 2 3 4 5 6	38	H.
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## CYSTOPTERIS

fragilis	i w e	s m n	c a u	1 2 3 4 5 -	56	B. h.
montana	- - e	- - n	- - u	- - - - 5 6	2	H.

## POLYSTICHUM

Lonchitis	i w e	s m n	- a u	- - 3 4 5 6	14	H.
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## POLYSTICHUM

aculeatum	i w e	s m n	c a u	1 2 3 4 - -	75	B.
angulare	i w e	s m -	c a -	1 2 - - - -	41	E.

## LASTREA

Thelypteris	i w e	s m n	c - -	1 2 - - - -	30	E. g.
Oreopteris	i w e	s m n	c a u	1 2 3 4 5 -	80	B.
Filix-mas	i w e	s m n	c a u	1 2 3 4 - -	94	B.
rigida	- w e	- m -	? a -	- - 3 - - -	3	I.
cristata	- w e	s m -	c - -	1 2 - - - -	4	E. i.
spinulosa	i w e	s m n	c a -	1 2 - - - -	30	E. b.
dilatata	i w e	s m n	c a u	1 2 3 4 5 6	82	B.
fœnisecii	i w e	s m n	c - -	1 2 3 - - -	19	A. b.

## ATHYRIUM

Filix-fœmina	i w e	s m n	c a -	1 2 3 4 - -	84	B.
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## PSEUDATHYRIUM

alpestre	- w e	- - n	- a u	- - - 4 5 6	7	H.
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## ASPLENIUM

viride	i w e	s m n	c a u	- 2 3 4 5 -	25	H.
Trichomanes	i w e	s m n	c a -	1 2 3 4 - -	81	B.
marinum	i w e	s m n	c - -	1 2 3 - - -	40	B. a.
lanceolatum	i w e	s - -	c - -	1 2 - - - -	12	A.
Ad. nigrum	i w e	s m n	c a -	1 2 3 4 - -	88	B.
Ruta-muraria	i w e	s m n	c a -	1 2 3 - - -	80	B.
germanicum	- w e	s m n	c a -	- ? 3 - - -	6	S. ?
septentrionale	- w e	s m n	c a -	- 2 3 4 5 -	10	S.

## SCOLOPENDRIUM

vulgare	i w e	s m n	c a -	1 2 3 - - -	77	B.
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## BLECHNUM

boreale	i w e	s m n	c a u	1 2 3 4 5 6	90	B.
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## PTERIS

aquilina	i w e	s m n	c a -	1 2 3 - - -	95	B.
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## ADIANTUM

C. Veneris	i w -	s m -	c - -	1 2 - - - -	5	A.
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## HYMENOPHYLLUM

Tunbridgense	i w e	s m n	c - -	1 2 3 - - -	17	A.
Wilsoni	i w e	s m n	c a u	? 2 3 4 5 -	33	A. h.

## OSMUNDA

regalis	i w e	s m n	c - -	1 2 3 - - -	61	B.
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## BOTRYCHIUM

Lunaria	i	w	e	s	m	n	c	a	u	1	2	3	4	5	-	78	B.
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## OPHIOGLOSSUM

vulgatum	i	w	e	s	m	n	c	a	-	1	2	3	-	-	-	60	B.
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88. *Lycopodiaceæ*. Species 6. Census 261.

## LYCOPODIUM

clavatum	i	w	e	s	m	n	c	a	u	1	2	3	4	-	-	62	B.
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annotinum	-	w	e	s	m	n	c	a	u	-	-	3	4	5	-	15	H.
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inundatum	-	w	e	s	m	n	c	a	-	1	2	3	-	-	-	40	B. e.
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alpinum	i	w	e	s	m	n	c	a	u	-	-	3	4	5	6	40	H.
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Selago	i	w	e	s	m	n	c	a	u	1	2	3	4	5	6	62	B. h.
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selaginoides	i	w	e	s	m	n	c	a	u	-	2	3	4	5	6	42	H.
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89. *Marsileaceæ*. Species 2. Census 58.

## ISOETES

lacustris	i	w	e	s	m	n	c	a	-	-	2	3	4	-	-	17	H.
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## PILULARIA

globulifera	i	w	e	s	m	n	c	a	-	1	2	3	-	-	-	41	B.
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90. *Equisetaceæ*. Species 9. Census 442.

## EQUISETUM

Telmateia	i	w	e	s	m	n	c	-	-	1	2	-	-	-	-	62	E. b.
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umbrosum	i	w	e	-	m	n	c	a	-	-	2	3	-	-	-	12	S.
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arvense	i	w	e	s	m	n	c	a	-	1	2	3	-	-	-	88	B.
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sylvaticum	i	w	e	s	m	n	c	a	u	1	2	3	4	5	-	69	B.
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palustre	i	w	e	s	m	n	c	a	u	1	2	3	4	5	-	84	B.
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limosum	i	w	e	s	m	n	c	a	-	1	2	3	4	-	-	78	B.
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hyemale	i	w	e	s	m	n	c	-	-	1	2	3	-	-	-	32	S. b.
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Mackaii	i	-	e	-	-	n	c	?	-	-	-	3	-	-	-	2	S.
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variegatum	i	w	e	s	m	n	c	a	-	1	2	3	-	-	-	15	S.
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1. *Hibernian species and varieties ;—absent or doubtful in England and Scotland.*

*Arabis ciliata*. The variety "*hispida*" occurs in Wales.

*Helianthemum guttatum*. The variety "*Breweri*" in Anglesea.

*Arenaria ciliata*. Closely allied to *A. norvegica*.

*Dryas depressa*. Accidental variety, now extinct?

*Saxifraga Geum*. This and two next on the Pyrenees.

*hirsuta*. Perhaps a variety of *S. Geum*.

*umbrosa*. Possibly native in Yorkshire.

*Andrewsii*. Known in gardens only.



- Saxifraga hirta*. Deemed a true species in Bab. Man.  
*affinis*. Also kept a species in Bab. Man.  
*pedatifida*. A doubtful and confused species.
- Erica mediterranea*. In Western France and Spain.  
*Maçkaii*. A variety of *E. Tetralix*? Variable.
- Arbutus Unedo*. From South-west France to Greece.
- Daboecia polifolia*. West France, Spain, Azores.
- Pinguicula grandiflora*. A variety of *P. vulgaris*?
- Ophrys gemmipara*. Not ascertained elsewhere. Rare.
- Sisyrinchium anceps*. Doubtful native. From America?
- Allium Babingtonii*. Doubtful species. Doubtful native.
- Potamogeton longifolius*. Doubtful species; imperfectly known.
- Naias flexilis*. Recently found. Easily overlooked. In Germany, &c.
- Carex Buxbaumii*. In North and Middle Europe.
- Arundo* "Lapponica." Said to be a variety of *A. stricta*.
- Asplenium anceps*. A variety of *A. Trichomanes*?  
*acutum*. A variety *A. Adiantum-nigrum*?
- Trichomanes radicans*. Spain, Azores, Madeira, &c.

## 2. *Explanations of the Summary.*

The preceding summary is intended to condense the leading facts of species-distribution into a tabular form, so as to admit of comparisons being readily made under the several heads. The list includes denizens and colonists along with the species presumed to be native in Britain; those more usually or more strongly suspected to be introduced aliens being omitted. A considerable number of segregate species will be observed in the list, especially many very dubious species of *Rubus* and *Hieracium*. It may be thought by some botanists, that in other instances several aggregate species have been too little subdivided. The course was not always optional; having regard to the objects sought by the summary. Occasionally, the choice was taken in accordance with the writer's own views about the expediency and facility of distinguishing the alleged species themselves. Occasionally, the choice became more compulsory, through the impossibility of assorting the records of their localities, if old aggregates were much divided into modern segregates. The list of species must thus be understood to represent, not simply and exclusively the individual author's own views about the facts of nature, but those views considerably modified, in order to meet the manner in which the same facts have been regarded

and recorded by other writers on British Botany. The letters and figures used as abbreviations will be explained below, under their respective heads or columns. The substitution of small horizontal marks '- -' instead of letters and figures, indicates that no satisfactory evidence has been found for the occurrence of the species in the divisions of the island to which such marks relate. The note of question '?' implies a doubt whether the alleged fact is sufficiently credit-worthy.

1. *Longitude*.—In the first column the letters 'w e' stand for West and East Britain, as explained on pages 136—138. A third letter 'i' has been prefixed, in order to show the plants which extend westward into Ireland; and if set in the running type 'i' it indicates a doubtful nativity of the species in that island. This part of the list may be less correct than the rest; the plants of Ireland being less fully ascertained. As authorities for their occurrence in the western island, Mackay's *Flora Hibernica* and the *Manual of British Botany* have been resorted to, with some corrections of errors and misprints, chiefly supplied by the Author of the *Manual*. The addition of Ireland, still more western than West Britain, is intended as a partial equivalent for the absence of a third longitudinal division in Britain itself; the form or figure of which prevented more than a binary division. Columns of ternary divisions were made by preference in the summary, because the interposition of an intermediate step in the series brings the extremes into clearer contrast, and brings out also those gradations of difference which cannot be so well exhibited by means of one single dividing line. (See page 136). But a detached island, having much less extent in latitude, is rather a leap than a gradation in the ternary series. A glance down the column will show that, while the eastern and western floras of Britain itself differ only by few species, the flora of Ireland wants many of those which occur in West Britain, as well as almost all of those which are absent from that side of the main island. The flora of Ireland is less fully known; and it seems likely enough that an increased knowledge of Hibernian botany may lead to some of the present blanks being filled in; but it is in the highest degree probable, that most of the British species so marked are truly absent from Ireland. Those few found in Ireland, and absent from Britain, are enumerated after the end of the summary.

2. *Latitude*.—In the second column the letters 's m n' stand for South, Middle, North; the three latitudinal divisions of Britain explained on pages 134—5. It will be noted by the increased number of

blanks, that greater differences are traceable between the floras of these latitudinal divisions, than was the case with those for longitude; also, that the blanks are least numerous in South Britain, most numerous in North Britain. The general flora, or total number of species, is thus shown to decrease in a northerly direction. Some small amount of this apparent decrease may be attributable to a less complete knowledge of the flora of North Britain; some of it also to the rejection of several species from that flora, which are admitted as being truly wild in South Britain, and are regarded as having been introduced thence into North Britain. But the decrease of numbers is mostly real; arising from the fact that many English species either do not extend into Scotland, or else occur there only in its most southerly provinces, the Lowlands, which constitute part of Middle Britain. The plants marked only by the single letter with two blanks preceding it '- - n' are chiefly those of the higher mountains, which fail to reappear on the hills of England and Wales. There are, however, some few plants so marked which are not mountain species; for example, the *Primula scotica*, *Goodyera repens*, and others hitherto recorded only from places of slight elevation. Together, these boreal and alpine species are not sufficiently numerous to counterbalance the absence of many southerly species; and thus the more northern flora is reduced in its total number of species.

3. *Altitude*.—In the third column a ternary division of the surface is made which has not before been adverted to. The letters 'c a u' signify three stages of elevation, 'coast-level, ascending, upper.' These divisions may be explained thus:—

- c. Below 200 yards of altitude.
- a. Between 200 and 700 yards.
- u. Above 700 yards of altitude.

While nearly all the species descend below 200 yards in some part of Britain, it is apparent from the list that a very large portion of them fail to reach the upper stage, that above 700 yards. Not unlikely, some of the plants may eventually be ascertained to ascend into a higher stage than is noted in the table; more especially several of those distinguished by the single letter 's - -' in the list. The heights have been examined chiefly in the provinces of Humber, Lakes, East and West Lowlands; with some few additional observations made in North Wales and North Highlands. It is quite likely that various species of the lower stage only, as they yet appear to be by the list, may truly ascend above 200 yards in some of the six most southerly provinces, if not so high in



Middle or North Britain. And as many circumstances interfere with exactness in the processes resorted to, for ascertaining the heights of localities, it may be as well to consider these three stages of altitude as slightly overlapping each other; for instance, like imbricating leaves.

4. *Climatal Zones*.—In the fourth column the ascending or climatal zones are expressed by the six corresponding numerals, '1 2 3' for those of the agrarian region, and '4 5 6' for the zones of the arctic region. The ascending zones were explained in volume first, pages 19 to 43; and they will probably (space sufficing) be again adverted to in this present volume. It will be recollected, that they are designed to illustrate the distribution of plants in accordance with the joint influence of latitude and elevation, more or less modified by longitude and local conditions. In general, the altitudes may be said to become lower as the latitudinal distance from the south coast of England increases. This is represented by the oblique lines of the little diagram introduced in the left-hand lower corner of the lithographic map inserted in volume third. Comparatively few species have so wide a range of latitude and elevation combined, as to place them in all the six zones.

5. *Census*.—In the fifth column the numerals show in how many of the 112 counties and vice-counties (volume third, pages 526 to 528) the species have been respectively ascertained to occur. No doubt several of them do occur in all those 112 sections of the surface; though incomplete records and knowledge lead to the numbers being always stated below 100. In reckoning up these numbers it was deemed better to reject many recorded localities, as being old and unconfirmed, or as being improbable in themselves, and reported only on unsafe authority. It may here be explained, while alluding to this matter, that the safety or reliability of the authority is not exclusively a personal consideration, but must in some degree depend also on the plant itself. Thus, any tyro may be trusted for a record of *Bellis perennis* or *Calluna vulgaris* in any county; because these and various other such familiar species can scarcely be mistaken and misnamed by any one who studies botany at all. Such is not the case with respect to many other plants; and no botanist pretends to an exact knowledge of all the critical and segregate species even of one single country. To establish the facts, that *Cyperus fuscus* occurs in Yorkshire, and *Lychnis alpina* in Cumberland, and truly wild, it required the exhibition of specimens in proof, and also an examination of their localities by botanists of skill and credit. To induce belief in the alleged wildness of *Gentiana acaulis* near Haverford



and near Liverpool, would require much better authority than any yet given for those unlikely localities. The seeming authority of Mr. Borrer even did not suffice to prevent distrust of the alleged locality for *Pyrola secunda* in Sussex, as expressed in volume second, page 162; and rightly so, as it subsequently appeared, when the error was explained in volume third, page 468. If all such records had been reckoned in, whatever their degree of probability or improbability, many of the plants would have had higher figures assigned to them in the census column. The numbers will in some degree subserve the second purpose of an index to the place of the same plant in the more expanded 'Census of Species,' intended to be printed in the next section of this volume. Their sum total for each order is given in the intermediate lines, as the 'census' of the orders, comparatively with the number of included species.

6. *Type of Distribution.*—In the sixth and last column the geographic types are indicated by their initial letters. These types were explained in volume first, pages 43 to 55. It was there particularly remarked, on page 54, that no abrupt line of severance or distinction could be traced between the groups of species so arranged; although, taken apart, the special character of their distribution is real. The use of two sets of initial letters is intended to meet this tendency towards transition from one type or distribution to another, through plants which have more or less an intermediate area. The capital letter will be understood to indicate the leading type of distribution for the species. The addition of a second small letter, the initial one of another type, will signify that the actual distribution of the species partially approaches also to that second type,—or, that it is somewhat intermediate between the two types, though nearest to that one indicated by the capital letter. Thus, for the first plant in the series, the letters 'E g' indicate that the distribution of the *Clematis* is English or southern, somewhat more diffused or more plentiful on the germanic or eastern side of the island. Again, the single letter 'H' for *Thalictrum alpinum* shows that this arctic species is assigned to the Highland or mountain type, with no evident tendency towards any other. The letter 'I' distinguishes some few plants which are found chiefly or exclusively in Mid Britain, and which are thus Intermediates not well assignable to any of the other geographic types. The note of doubt or interrogation '?' is to be understood as an expression of uncertainty about the proper type to which the plant should be referred, either primarily or secondarily.

In the list or summary here under explanation, the plants are arranged after the usual manner, that is, in accordance with structural classification, as understood by botanical systematists. But such an arrangement has only faint relations with geography. Under no aspect can it be said to bring plants together in accordance with their geographical connexions or similarities. The advantage of such a summary, so arranged, is that it places the leading geographical peculiarities of each several species under the eye in a single line; that line being readily found by any botanist moderately conversant with systematic classification. And the lines for different species can be compared with each other at a glance.

In the other lists which are to succeed the one under notice, on the contrary, the names of plants are brought near together, or placed in series, in accordance with their geographical relations; namely, according to their frequency or infrequency, the area over which they are diffused, the altitude to which they ascend, &c., &c. In short, the various similarities which will bring the plants near together in other lists, and so constitute their arrangement, are those of distribution, not those of structure.

## VI. CENSUS OF SPECIES.

Co.	38 Subprovinces.	S.	N.	W.	Sc.	E.	Bentham.
99	Ranunculus Flammula	19	19	12	13	13	
99	Plantago lanceolata 2	"			"		
98	Ranunculus acris 3	"			"		
97	Trifolium repens 4	"			"		
97	Bellis perennis 5	"			"		
97	Ranunculus repens	"			"		
96	Cerastium triviale	"			"		glomeratum
96	Achillea Millefolium	"			"		
95	Rumex Acetosa 9	"			"		
95	Taraxacum officinale	"			"		545
95	Plantago major 11	"			"		
95	Stellaria media 12	"			"		
95	Senecio vulgaris	"			"		
95	Calluna vulgaris	"			"		
95	Scabiosa succisa	"			"		
95	Pteris aquilina 16	"			"		
95	Heracleum Sphondylium	"			"		
95	Senecio Jacobæa 18	"			"		
95	Epilobium montanum	"			"		
95	Trifolium pratense	"			"		
95	Cardus lanceolatus	"			"		
95	Arctium Lappa, etc.	"			"		
95	Iris Pseudacorus	"			"		
94	Holcus lanatus 24	"			"		
94	Urtica dioica 25	"			"		
94	Linum catharticum	"			"		
94	Lastrea Filix-mas	"			"		
94	Myosotis arvensis	"			"		

Co.	38 Sps. cont.	S.	N.	W.	Sc.	E.	Benth.
94	<i>Polygonum aviculare</i>	19	19	12	13	13	
93	<i>Festuca ovina</i> 30	"		"			297, 627
93	<i>Euphrasia officinalis</i>	"		"			
93	<i>Caltha palustris</i> 32	"		"			1351
93	<i>Spiræa Ulmaria</i>	"		"			
93	<i>Lolium perenne</i>	"		"			
93	<i>Bromus mollis</i> 35	"		"			415, 465
93	<i>Potentilla anserina</i>	"		"			
93	<i>Polypodium vulgare</i>	"		"			
92	<i>Prunella vulgaris</i> 38	"		"			
92	<i>Potentilla Tormentilla</i>	"		"			
92	<i>Galium verum</i> 40	"		"			
92	<i>Galium palustre</i>	"		"			
92	<i>Centaurea nigra</i>	"		"			743
92	<i>Capsella Bursa</i> 43	"		"			
92	<i>Geranium molle</i>	"		"			
91	<i>Thymus Serpyllum</i>	"		"			
91	<i>Rumex Acetosella</i>	"		"			
91	<i>Agrostis vulgaris</i>	"		"			alba
91	<i>Poa annua</i> 48	"		"			
91	<i>Cynosurus cristatus</i>	"		"			
91	<i>Dactylis glomerata</i>	"		"			
91	<i>Lathyrus pratensis</i>	"		"			
91	<i>Erica Tetralix</i> 52	"		"			
91	<i>Hypericum pulchrum</i>	"		"			
91	<i>Angelica sylvestris</i>	"		"			
91	<i>Senecio aquaticus</i>	"		"			
90	<i>Blechnum boreale</i>	"		"			
90	<i>Juncus bufonius</i> 57	"		"			
90	<i>Carduus palustris</i>	"		"			
90	<i>Rhinanthus Crista-galli</i>	"		"			
90	<i>Spergula arvensis</i>	"		"			
90	<i>Veronica arvensis</i>	"		"			
90	<i>Carduus arvensis</i>	"		"			
90	<i>Sinapis arvensis</i> 63	"		"			
90	<i>Pyrethrum inodorum</i>	"		"			732
90	<i>Euphorbia Helioscopia</i>	"		"			
90	<i>Stachys sylvatica</i> 66	"		"			
90	<i>Stachys palustris</i> 67	"		"			1027



Co.	38 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham,
89	<i>Sagina procumbens</i>	19	19	12	13	13	434, etc.
89	<i>Primula vulgaris</i> 69	"		"			383, 1315
89	<i>Veronica Beccabunga</i>	"		"			
89	<i>Lychnis diurna</i> 71	"		"			
89	<i>Lychnis Flos-cuculi</i>	"		"			
89	<i>Arrhenatherum avenaceum</i>	"		"			
89	<i>Pedicularis sylvatica</i> 74	"		"			
89	<i>Veronica serpyllifolia</i>	"		"			1059
89	<i>Polygonum amphibium</i>	"		"			
89	<i>Achillea Ptarmica</i>	"		"			
89	<i>Vicia Cracca</i> 78	"		"			
88	<i>Galium saxatile</i>	"		"			964, 1381
88	<i>Cardamine pratensis</i>	"		"			
88	<i>Equisetum arvense</i>	"		"			
88	<i>Erica cinerea</i> 82	"		"			
88	<i>Galeopsis Tetrahit</i>	"		"			588
88	<i>Glyceria fluitans</i>	"		"			838
88	<i>Rumex crispus</i> 85	"		"			910
88	<i>Artemisia vulgaris</i>	"		"			
87	<i>Anthoxanthum odoratum</i>	"		"			
87	<i>Viola sylvatica</i> 88	"		"			601, etc.
87	<i>Veronica officinalis</i>	"		"			
87	<i>Cerastium glomeratum</i>	"		"			96, etc.
87	<i>Triticum repens</i> 91	"		"			378, 978
87	<i>Lamium purpureum</i>	"		"			467
87	<i>Pedicularis palustris</i>	"		"			
86	<i>Luzula campestris</i>	"		"			256
86	<i>Poa trivialis</i> 95	"		"			
86	<i>Urtica urens</i> 96	"		"			
85	<i>Eriophorum angustifolium</i>	"		"			670, 1318
85	<i>Agrostis alba</i> 98	"		"			47
85	<i>Papaver dubium</i>	"		"			
85	<i>Chenopodium album</i>	"		"			1013
85	<i>Chrysanthemum segetum</i>	"		"			
84	<i>Poa pratensis</i> 102	"		"			
84	<i>Aira cæspitosa</i> 103	"		"			1141
84	<i>Juncus lampocarpus</i>	"		"			190, 208
84	<i>Equisetum palustre</i>	"		"			
84	<i>Athyrium Filix-fœmina</i>	"		"			

Co.	38 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
84	<i>Viola tricolor</i> 107	19	19	12	13	13	688, 1231
83	<i>Triglochin palustre</i>	"			"		
82	<i>Epilobium palustre</i>	"			"		
82	<i>Lycopsis arvensis</i> 110	"			"		
82	<i>Menyanthes trifoliata</i>	"			"		
81	<i>Raphanus Raphanistrum</i>	"			"		968
80	<i>Aira præcox</i> 113	"			"		
80	<i>Carex vulgaris</i> 114	"			"		874, etc.
80	<i>Anthyllis vulneraria</i>	"			"		
78	<i>Stellaria uliginosa</i>	"			"		
78	<i>Plantago Coronopus</i>	"			"		
78	<i>Equisetum limosum</i>	"			"		
78	<i>Potamegeton " natans "</i>	"			"		429, 900
76	<i>Veronica Anagallis</i> 120	"			"		
37 Subprovinces.							
94	<i>Lotus corniculatus</i> 121	19	18	12	12	13	346
94	<i>Campanula rotundifolia</i>	19	18	12	12	13	
92	<i>Juncus effusus</i> 123	19	18	12	12	13	151
92	<i>Veronica Chamædrys</i>	19	18	12	12	13	
92	<i>Hypochaeris radicata</i>	19	18	12	12	13	
92	<i>Galium Aparine</i> 126	19	18	12	12	13	1380
91	<i>Polygala vulgaris</i> 127	19	18	12	12	13	1179, 1388
91	<i>Corylus Avellana</i> 128	19	18	12	12	13	
90	<i>Hieracium Pilosella</i>	19	18	12	12	13	
90	<i>Apargia autumnalis</i>	19	18	12	12	13	
90	<i>Lapsana communis</i>	19	18	12	12	13	
90	<i>Lonicera Periclymenum</i>	18	19	11	13	13	
89	<i>Hedera Helix</i> 133	19	18	12	12	13	
88	<i>Vicia sepium</i> 134	19	18	12	12	13	
88	<i>Sisymbrium officinale</i>	19	18	12	12	13	
88	<i>Polygonum Convolvulus</i>	19	18	12	12	13	
88	<i>Rumex obtusifolius</i>	19	18	12	12	13	
88	<i>Bartsia Odontites</i> 138	19	18	12	12	13	
88	<i>Asplenium A. nigrum</i>	19	18	12	12	13	
88	<i>Digitalis purpurea</i>	19	18	12	12	13	
88	<i>Orchis maculata</i> 141	18	19	11	13	13	
88	<i>Phalaris arundinacea</i>	19	18	12	12	13	
87	<i>Tussilago Farfara</i> 143	19	18	12	12	13	
87	<i>Chrysanthemum Leucanth.</i> 19 18	19	18	12	12	13	

Co.	37 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
87	Polygonum Persicaria	19	18	12	12	13	
87	Daucus Carota 146	19	18	12	12	13	1026
86	Callitriche "verna"	19	18	12	12	13	508, etc.
86	Solidago Virgaurea	18	19	12	13	12	
86	Valeriana officinalis	19	18	12	12	13	
86	Conium maculatum	19	18	12	12	13	
85	Juncus conglomeratus	19	19	12	12	13	effusus
85	Veronica agrestis	19	18	12	12	13	414
85	Sedum acre 153	19	18	12	12	13	
84	Sonchus arvensis	19	18	12	12	13	
84	Oxalis Acetosella 155	19	18	12	12	13	
84	Alopecurus geniculatus	19	18	12	12	13	1024, 1048
84	Arenaria serpyllifolia	19	18	12	12	13	
83	Melampyrum pratense	19	18	12	12	13	
83	Arundo Phragmites	19	18	12	12	13	
82	Lastrea dilatata 160	19	18	12	12	13	825, 881
81	Hydrocotyle vulgaris	19	18	12	12	13	
81	Asplenium Trichomanes	19	18	12	12	13	853
80	Molinia cærulea 163	18	19	11	13	13	
80	Drosera rotundifolia	18	19	12	13	12	
78	Luzula sylvatica	18	19	11	13	13	
77	Triodia decumbens	18	19	11	13	13	
77	Carex stellulata	19	18	12	12	13	
77	Orchis latifolia 168	19	18	12	12	13	
76	Aira caryophyllea	19	18	12	12	13	
75	Aira flexuosa 170	18	19	11	13	13	
75	Nardus stricta 171	18	19	12	13	12	
72	Carex ampullacea	18	19	12	13	12	
71	Juncus squarrosus	18	19	11	13	13	
70	Pyrus Aucuparia 174	18	19	12	13	12	
36 Subprovinces.							
94	Geranium robertianum	19	17	12	11	13	
91	Sonchus oleraceus 176	18	18	11	12	13	431
90	Rosa canina, etc.	19	17	12	11	13	
90	Stellaria graminea	19	17	12	11	13	
89	Scrophularia nodosa	19	17	12	11	13	
88	Fragaria vesca 180	18	18	11	12	13	
86	Alnus glutinosa	19	17	12	11	13	
86	Ranunculus aquatilis	19	17	12	11	13	196, etc.

Co.	36 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
85	<i>Alchemilla arvensis</i>	19	17	12	11	13	
85	<i>Fumaria officinalis</i>	19	17	12	11	13	239, etc.
85	<i>Nasturtium officinale</i>	19	17	12	11	13	
85	<i>Erythræa Centaurium</i>	19	17	12	11	13	785, etc.
84	<i>Carex glauca</i> 187	19	17	12	11	13	
84	<i>Teucrium Scorodonia</i>	18	18	12	12	12	
83	<i>Anthriscus sylvestris</i>	19	17	12	11	13	
83	<i>Juncus acutiflorus</i>	18	18	11	12	13	lampocarpus
82	<i>Erodium cicutarium</i>	19	17	12	11	13	
81	<i>Carex panicea</i> 192	18	18	11	13	12	1177
81	<i>Betula alba</i> , etc.	19	17	12	11	13	
80	<i>Montia fontana</i> 194	18	18	12	12	12	
80	<i>Alopecurus pratensis</i>	18	18	11	12	13	
80	<i>Ranunculus hederaceus</i>	19	17	12	11	13	aquatilis
80	<i>Narthecium ossifragum</i>	17	19	12	13	11	
80	<i>Bunium flexuosum</i>	19	17	12	11	13	
80	<i>Lastrea Oreopteris</i>	19	17	12	11	13	
80	<i>Anagallis tenella</i> 200	19	17	12	11	13	
79	<i>Scirpus palustris</i>	19	17	12	11	13	1019
79	<i>Carex "flava"</i> 202	17	19	11	13	12	500
78	<i>Botrychium Lunaria</i>	18	18	12	12	12	
78	<i>Luzula pilosa</i> 204	18	18	11	12	13	957
77	<i>Cardamine hirsuta</i>	18	18	12	12	12	502
77	<i>Comarum palustre</i>	17	19	11	13	12	
77	<i>Scirpus setaceus</i> 207	18	18	12	12	12	
76	<i>Juncus supinus</i> 208	18	18	11	12	13	lampocarpus
74	<i>Atriplex hastata</i>	19	17	12	11	13	258, etc.
74	<i>Asperula odorata</i>	19	17	12	11	13	
74	<i>Carex pulicaris</i> 211	17	19	11	13	12	
71	<i>Carex binervis</i> 212	17	19	10	13	13	distans
70	<i>Salix repens</i> , etc.	18	18	12	12	12	1230
69	<i>Equisetum sylvaticum</i>	17	19	11	13	12	
68	<i>Myosotis cæspitosa</i>	18	18	12	12	12	palustris
67	<i>Hippuris vulgaris</i>	19	17	12	11	13	
66	<i>Peplis Portula</i>	19	17	12	11	13	
61	<i>Salix aurita</i> 218	18	18	11	12	13	
35 Subprovinces.							
94	<i>Ulex europæus</i> 219	19	16	12	10	13	
87	<i>Spartium scoparium</i>	19	16	12	10	13	



Co.	35 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
86	<i>Geranium dissectum</i> 19		16	12	10	13	
84	<i>Mercurialis perennis</i>	19	16	12	10	13	
84	<i>Trifolium "procumbens"</i>	19	16	12	10	13	
83	<i>Ajuga reptans</i> 224	19	16	12	10	13	
83	<i>Stellaria Holostea</i>	19	16	12	10	13	
82	<i>Ranunculus Ficaria</i>	19	16	12	10	13	
82	<i>Chrysosplenium oppositif.</i>	18	17	12	11	12	
82	<i>Ranunculus sceleratus</i>	19	16	12	10	13	
81	<i>Draba verna</i> 229	19	16	12	10	13	
80	<i>Rosa mollis</i> , etc.	16	19	12	13	10	
80	<i>Ononis arvensis</i>	19	16	12	10	13	469
80	<i>Quercus Robur</i> 232	19	16	12	10	13	
79	<i>Orobis tuberosus</i>	17	18	12	12	11	
79	<i>Veronica hederifolia</i>	19	16	12	10	13	
79	<i>Brachypodium sylvaticum</i>	19	16	12	10	13	
79	<i>Sparganium ramosum</i>	19	16	12	10	13	
79	<i>Senecio sylvaticus</i> 237	18	17	11	11	13	
77	<i>Scutellaria galericulata</i>	19	16	12	10	13	
77	<i>Fumaria capreolata</i>	18	17	12	11	12	officinalis
77	<i>Vicia sativa</i> , etc. 240	19	16	12	10	13	
77	<i>Gymnadenia Conopsea</i>	17	18	10	12	13	
77	<i>Scolopendrium vulgare</i>	19	16	12	10	13	
76	<i>Holcus mollis</i> 243	18	17	12	11	12	
76	<i>Carex ovalis</i> 244	17	18	11	12	12	
76	<i>Veronica scutellata</i>	18	17	12	11	12	
75	<i>Myosotis versicolor</i>	18	17	11	11	13	
74	<i>Lamium amplexicaule</i>	18	17	12	11	12	992
74	<i>Salix cinerea</i> , etc.	19	16	12	10	13	caprea
73	<i>Trifolium medium</i>	18	17	12	11	12	
73	<i>Stachys arvensis</i> 250	18	17	12	11	12	
73	<i>Hieracium vulgatum</i>	18	17	11	11	13	murorum
71	<i>Plantago maritima</i>	17	18	11	13	11	
71	<i>Scirpus lacustris</i> 253	18	17	12	11	12	718, 1297
70	<i>Tanacetum vulgare</i>	18	17	12	11	12	
67	<i>Luzula multiflora</i>	17	18	10	12	13	campestris
67	<i>Scirpus cæspitosus</i>	16	19	12	13	10	
65	<i>Glaux maritima</i> 257	18	17	12	13	10	
64	<i>Atriplex angustifolia</i>	19	16	12	10	13	hastata
54	<i>Juncus compressus</i>	19	16	12	10	13	^

Co.	34 Subprovinces.	S.	N.	W.	Sc.	E.	Bentham.
86	Pimpinella Saxifraga	19	15	12	9	13	
85	Anemone nemorosa	19	15	12	9	13	
85	Cratægus Oxyacantha	19	15	12	9	13	
85	Prunus spinosa 263	18	16	11	10	13	
85	Alisma Plantago	19	15	12	9	13	
84	Lycopus europæus	19	15	12	9	13	
83	Mentha aquatica 266	19	15	12	9	13	
83	Glechoma hederacea	19	15	12	9	13	
82	Gnaphalium uliginosum	18	16	11	10	13	
82	Lysimachia nemorum	18	16	12	10	12	
82	Sherardia arvensis 270	19	15	12	9	13	
82	Hypericum quadrangulum	19	15	12	9	13	
81	Lemna minor 272	18	16	11	10	13	
81	Polygonum Hydropiper	18	16	12	10	12	
80	Crepis virens 274	19	15	12	9	13	
80	Asplenium R. muraria	18	16	12	10	12	
80	Rnautia arvensis 276	19	15	12	9	13	
80	Eupatorium cannabinum	19	15	12	9	13	
80	Solanum Dulcamara	19	15	12	9	13	
79	Mentha arvensis 279	19	15	12	9	13	
79	Hypericum perforatum	19	15	12	9	13	
79	Vicia hirsuta 281	19	15	12	9	13	
77	Gentiana campestris	15	19	11	13	10	
77	Epilobium tetragonum	18	16	11	10	13	
76	Vaccinium Myrtillus	15	19	11	13	10	
76	Malva sylvestris 285	19	15	12	9	13	
75	Habenaria bifolia	18	16	11	10	13	625
75	Polystichum aculeatum	19	15	12	9	13	728
74	Sanicula europæa	18	16	11	10	13	
73	Orchis mascula 289	18	16	11	10	13	
73	Scleranthus annuus	18	16	11	10	13	
72	Sagina nodosa 291	17	17	12	11	11	
72	Gnaphalium sylvaticum	17	17	10	11	13	1357
72	Ilex Aquifolium 293	18	16	11	10	13	
71	Pinguicula vulgaris	15	19	10	13	11	
71	Habenaria viridis	16	18	9	12	13	
70	Fedia olitoria 296	18	16	11	10	13	
69	Festuca duriuscula	16	18	10	12	12	ovina
67	Festuca bromoides	19	15	12	9	13	742

Co.	34 Sps. cont.	S. N.	W.	Sc.	E.	Bentham.
66	<i>Centaurea Cyanus</i>	18 16	11	10	13	
65	<i>Armeria maritima</i>	16 18	10	13	11	
63	<i>Carex pilulifera</i> 301	18 16	11	10	13	
62	<i>Littorella lacustris</i>	16 18	10	12	12	
62	<i>Lycopodium Selago</i>	15 19	12	13	9	
60	<i>Helosciadium inundatum</i>	18 16	11	10	13	
59	<i>Triglochin maritimum</i>	17 17	11	13	10	
33 Subprovinces.						
87	<i>Geum urbanum</i> 306	19 14	12	8	13	
82	<i>Torilis Anthriscus</i>	19 14	12	8	13	
82	<i>Agrimonia Eupatoria</i>	19 14	12	8	13	1065
80	<i>Ranunculus bulbosus</i>	19 14	12	8	13	
79	<i>Erysimum Alliaria</i>	19 14	12	8	13	
79	<i>Chærophyllum temulentum</i>	19 14	12	8	13	
79	<i>Reseda Luteola</i> 312	19 14	12	8	13	
78	<i>Silene inflata</i> 313	19 14	12	8	13	424
78	<i>Phleum pratense</i>	19 14	12	8	13	
77	<i>Lychuis Githago</i>	18 15	11	9	13	
77	<i>Listera ovata</i> 316	18 15	11	9	13	
77	<i>Anagallis arvensis</i>	19 14	12	8	13	630
76	<i>Hyacinthus nonscriptus</i>	17 16	11	10	12	
76	<i>Echium vulgare</i> 319	18 15	12	9	12	
76	<i>Circæa Lutetiana</i>	19 14	12	8	13	
76	<i>Malva moschata</i>	19 14	12	8	13	
75	<i>Allium ursinum</i> 322	18 15	12	9	12	
75	<i>Hypericum humifusum</i>	19 14	12	8	13	
74	<i>Trifolium arvense</i>	19 14	12	8	13	
74	<i>Epilobium parviflorum</i>	19 14	12	8	13	
71	<i>Rubus Idæus</i> 326	16 17	11	11	11	
71	<i>Bromus giganteus</i>	19 14	12	8	13	
70	<i>Papaver Argemone</i>	19 14	12	8	13	
70	<i>Sparganium simplex</i>	19 14	12	8	13	
69	<i>Polygonum lapathifolium</i>	19 14	12	8	13	
68	<i>Festuca pratensis</i>	18 15	11	9	13	relatior
68	<i>Geum rivale</i> 332	16 17	10	11	12	
68	<i>Gentiana Amarella</i>	18 15	11	9	13	
68	<i>Rumex sanguineus</i>	19 14	12	8	13	
67	<i>Alisma ranunculoides</i>	18 15	11	9	13	
66	<i>Eriophorum vaginatum</i>	14 19	12	13	8	

Co.	33 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
66	<i>Carex vulpina</i> 337	19	14	12	8	13	
62	<i>Viola palustris</i> 338	15	18	11	12	10	
61	<i>Nymphæa alba</i> 339	16	17	10	11	12	
61	<i>Osmunda regalis</i>	17	16	11	10	12	
60	<i>Populus tremula</i>	16	17	10	11	12	
60	<i>Myriophyllum spicatum</i>	19	14	12	8	13	631
56	<i>Koeleria cristata</i> 343	17	16	11	10	12	
49	<i>Schœnus nigricans</i>	15	18	11	10	12	
32 Subprovinces.							
82	<i>Medicago lupulina</i>	19	13	12	7	13	
82	<i>Lotus major</i> 346	19	13	12	7	13	corniculatus
79	<i>Euphorbia Peplus</i>	19	13	12	7	13	
78	<i>Fraxinus excelsior</i>	18	14	11	8	13	
78	<i>Linaria vulgaris</i> 349	19	13	12	7	13	
76	<i>Galium cruciatum</i>	19	13	12	7	13	
75	<i>Potentilla Fragariastrum</i>	19	13	12	7	13	
75	<i>Bromus asper</i> 352	19	13	12	7	13	
74	<i>Arenaria trinervis</i>	19	13	12	7	13	
72	<i>Salix caprea</i> 354	19	13	12	7	13	248
72	<i>Genista anglica</i>	19	13	12	7	13	
71	<i>Viburnum Opulus</i>	18	14	11	8	13	
71	<i>Petasites vulgaris</i>	18	14	11	8	13	
71	<i>Sambucus nigra</i> 358	19	13	12	7	13	
70	<i>Adoxa moschatellina</i>	19	13	12	7	13	
69	<i>Spergularia rubra</i>	18	14	12	8	12	376
69	<i>Trifolium "filiforme"</i>	18	14	11	8	13	
68	<i>Arabis hirsuta</i> 362	18	14	12	8	12	
68	<i>Ægopodium Podagraria</i>	18	14	11	8	13	
67	<i>Hieracium boreale</i>	18	14	11	8	13	896, etc.
67	<i>Carex præcox</i> 365	18	14	11	8	13	
65	<i>Arabis thaliana</i>	18	14	12	8	12	
65	<i>Catabrosa aquatica</i>	16	16	9	10	13	
65	<i>Lychnis vespertina</i>	18	14	11	8	13	
65	<i>Lysimachia vulgaris</i>	19	13	12	7	13	
64	<i>Potamogeton crispus</i>	18	14	11	8	13	
62	<i>Avena pubescens</i> 371	16	16	11	10	11	pratensis
62	<i>Carex speirostachya</i>	13	19	7	13	12	distans
62	<i>Lycopodium clavatum</i>	15	17	10	11	11	
58	<i>Potamogeton pusillus</i>	18	14	11	8	13	717, etc.



Co.	32 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
57	<i>Utricularia vulgaris</i>	17	15	10	9	13	
54	<i>Spergularia marina</i>	17	15	12	11	9	rubra
54	<i>Potamogeton perfoliatus</i>	17	15	10	9	13	
51	<i>Triticum "junceum"</i>	16	16	11	12	9	repens
50	<i>Agrostis canina</i> 349	16	16	10	10	12	
46	<i>Atriplex Babingtonii</i>	16	16	11	12	9	hastata
31 Subprovinces.							
76	<i>Briza media</i> 381	18	13	11	7	13	
76	<i>Lythrum Salicaria</i>	19	12	12	6	13	
75	<i>Primula veris</i> 383	18	13	11	7	13	vulgaris
75	<i>Potentilla reptans</i>	19	12	12	6	13	
75	<i>Parietaria officinalis</i>	19	12	12	6	13	
74	<i>Æthusa Cynapium</i>	19	12	12	6	13	
73	<i>Barbarea vulgaris</i>	19	12	12	6	13	1184, 1246
72	<i>Filago germanica</i>	17	14	10	8	13	1061, 1071
72	<i>Scandix Pecten</i> 389	19	12	12	6	13	
70	<i>Alchemilla vulgaris</i>	14	17	11	11	9	
70	<i>Origanum vulgare</i>	18	13	12	7	12	
70	<i>Pyrethrum Parthenium</i>	19	12	12	6	13	
69	<i>Geranium lucidum</i>	17	14	12	8	11	
69	<i>Tragopogon pratensis</i>	19	12	12	6	13	
69	<i>Fedia dentata</i> 395	19	12	12	6	13	
68	<i>Veronica montana</i>	18	13	12	7	12	
68	<i>Ornithopus perpusillus</i>	18	13	11	7	13	
68	<i>Geranium pratense</i>	17	14	11	8	12	
68	<i>Hypericum hirsutum</i>	18	13	11	7	13	
67	<i>Carex remota</i> 400	17	14	11	8	12	
67	<i>Bromus sterilis</i>	19	12	12	6	13	
66	<i>Rumex conglomeratus</i>	19	12	12	6	13	
66	<i>Samolus Valerandi</i>	19	12	12	6	13	
65	<i>Nuphar lutea</i> 404	19	12	12	6	13	1221
64	<i>Lithospermum arvense</i>	17	14	11	8	12	
64	<i>Typha latifolia</i> 406	19	12	12	6	13	
63	<i>Rosa spinosissima</i>	16	15	11	9	11	
63	<i>Jasione montana</i>	18	13	12	7	12	
62	<i>Radiola millegrana</i>	16	15	11	9	11	
62	<i>Myrica Gale</i> 410	15	16	10	10	11	
62	<i>Bidens tripartita</i>	19	12	12	6	13	
62	<i>Cerastium semidecandrum</i>	19	12	12	6	13	glomeratum

Co.	31 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
61	<i>Filago minima</i> 413	17	14	10	8	13	
61	<i>Veronica polita</i>	19	12	12	6	13	agrestis
61	<i>Bromus commutatus</i>	18	13	11	7	13	mollis
60	<i>Festuca "elatio"</i> 416	15	16	9	10	12	331, 1156
60	<i>Ophioglossum vulgatum</i>	16	15	10	9	12	
59	<i>Carex paniculata</i>	17	14	10	9	12	687, 1338
59	<i>Hieracium umbellatum</i>	19	12	12	6	13	
58	<i>Lithospermum officinale</i>	18	13	12	7	12	
57	<i>Carex muricata</i> 421	18	13	11	7	13	746
56	<i>Aster Tripolium</i>	16	15	10	11	10	
56	<i>Anthriscus vulgaris</i>	17	14	11	8	12	
56	<i>Silene maritima</i> 424	13	18	10	13	8	inflata
56	<i>Carex pallescens</i>	15	16	9	10	12	
54	<i>Rhynchospora alba</i> *	16	15	11	10	10	
53	<i>Ammophila arundinacea</i>	14	17	9	13	9	
53	<i>Scirpus fluitans</i> 428	15	16	9	10	12	
53	<i>Thlaspi arvense</i>	17	14	10	9	12	
53	<i>Salix viminalis</i>	18	13	11	7	13	509
50	<i>Sonchus asper</i> 431	18	13	11	8	12	oleraceus
30 Subprovinces.							
72	<i>Epilobium hirsutum</i>	19	11	12	5	13	
71	<i>Calamintha Clinopodium</i>	19	11	12	5	13	
71	<i>Lamium album</i> 435	19	11	12	5	13	
70	<i>Epilobium angustifolium</i>	13	17	8	11	11	
70	<i>Hyoscyamus niger</i>	19	11	12	5	13	
69	<i>Helianthemum vulgare</i>	17	13	11	7	12	
69	<i>Convolvulus sepium</i>	19	11	12	5	13	
68	<i>Oenanthe crocata</i> 440	17	13	12	8	10	
67	<i>Carduus acanthoides</i>	19	11	12	5	13	
67	<i>Cichorium Intybus</i>	19	11	12	5	13	
67	<i>Juncus glaucus</i> 442	19	11	12	5	13	947
67	<i>Coronopus Ruellii</i>	19	11	12	5	13	
65	<i>Gnaphalium dioicum</i>	11	19	7	13	10	
65	<i>Ranunculus auricomus</i>	18	12	11	6	13	
65	<i>Symphytum officinale</i>	19	11	12	5	13	
64	<i>Saxifraga tridactylites</i>	18	12	12	6	12	
63	<i>Scirpus sylvaticus</i>	17	13	11	7	12	
63	<i>Carex hirta</i> 449	18	12	10	7	13	
62	<i>Epipactis latifolia</i>	18	12	12	6	12	918, 1132

Co.	30 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
60	<i>Lepidium campestre</i>	18	12	12	6	12	
58	<i>Prunus avium</i> 452	18	12	11	6	13	Cerasus
58	<i>Bidens cernua</i> 453	18	12	12	6	12	
57	<i>Ranunculus hirsutus</i>	19	11	12	5	13	
57	<i>Calamintha Acinos</i>	18	12	12	6	12	
56	<i>Nasturtium terrestre</i>	18	12	12	6	12	
56	<i>Neottia Nidus-avis</i>	18	12	10	7	13	
55	<i>Mentha sativa</i> , etc.	17	13	11	7	12	
54	<i>Carex paludosa</i> 459	18	12	10	7	13	496
53	<i>Honckeneja peploides</i>	14	16	9	12	9	
53	<i>Carex arenaria</i> 461	13	17	9	13	8	437
53	<i>Carex vesicaria</i> 462	16	14	11	8	11	
51	<i>Lolium temulentum</i>	18	12	11	6	13	
49	<i>Salicornia herbacea</i>	15	15	10	11	9	1129
49	<i>Bromus secalinus</i> 465	16	14	10	8	12	mollis
49	<i>Thalictrum</i> "minus"	12	18	10	12	8	1078
48	<i>Lamium incisum</i>	16	14	10	8	12	purpureum
47	<i>Salix alba</i> , etc.	17	13	12	7	11	
47	<i>Ononis spinosa</i> 469	18	12	11	6	13	arvensis
46	<i>Utricularia minor</i>	16	14	10	9	11	1054
41	<i>Pilularia globulifera</i>	16	14	11	8	11	
29 Subprovinces.							
71	<i>Myosotis palustris</i> 472	19	10	12	4	13	215, 686
70	<i>Convolvulus arvensis</i>	19	10	12	4	13	
69	<i>Pulicaria dysenterica</i>	19	10	12	4	13	
67	<i>Verbascum Thapsus</i>	17	12	11	6	12	
67	<i>Helosciadium nodiflorum</i>	19	10	12	4	13	
67	<i>Carex sylvatica</i> 477	17	12	11	6	12	
67	<i>Centaurea Scabiosa</i>	19	10	12	4	13	
65	<i>Melica uniflora</i> 479	17	12	11	6	12	
65	<i>Euphorbia exigua</i>	19	10	12	4	13	
64	<i>Parnassia palustris</i>	11	18	7	12	10	
64	<i>Chenopodium Henricus</i>	18	11	12	5	12	
62	<i>Equisetum Telmateia</i>	18	11	12	5	12	
62	<i>Carlina vulgaris</i> 484	18	11	11	5	13	
62	<i>Polygonum Bistorta</i>	17	12	11	6	12	
60	<i>Vicia sylvatica</i> 486	15	14	11	8	10	
60	<i>Corydalis claviculata</i>	16	13	12	7	10	
60	<i>Sium angustifolium</i>	18	11	11	5	13	

Co.	32 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
58	<i>Hieracium murorum</i>	12	17	10	11	8	250, etc.
58	<i>Triticum caninum</i>	16	13	11	7	11	
58	<i>Allium vineale</i> 491	18	11	12	5	12	
57	<i>Juniperus communis</i>	12	17	8	11	10	975
57	<i>Glyceria aquatica</i>	18	11	10	6	13	
56	<i>Galeopsis Ladanum</i>	18	11	11	5	13	
55	<i>Myosotis collina</i>	17	12	12	6	11	
55	<i>Carex riparia</i> 496	18	11	11	5	13	paludosa
54	<i>Carex dioica</i> 497	10	19	6	13	10	
54	<i>Carex pendula</i> 498	18	11	12	5	12	
52	<i>Zannichellia palustris</i>	18	11	11	5	13	
51	<i>Carex "Oederi"</i> 500	16	13	11	7	11	flava
51	<i>Astragalus glycyphyllos</i>	17	12	9	7	13	
50	<i>Cardamine sylvatica</i>	15	14	10	8	11	hirsuta
48	<i>Cakile maritima</i> 503	13	16	9	12	8	
47	<i>Glyceria maritima</i>	14	15	8	12	9	
44	<i>Scirpus multicaulis</i>	14	15	10	9	10	
44	<i>Carex acuta</i> 506	16	13	9	8	12	
43	<i>Cerastium tetrandum</i>	14	15	11	10	8	glomeratum
41	<i>Callitriche platycarpa</i>	15	14	10	8	11	verna
36	<i>Salix Smithiana</i> , etc.	18	11	11	5	13	viminalis?
28 Subprovinces.							
72	<i>Papaver Rhæas</i> 510	19	9	12	3	13	
65	<i>Malva rotundifolia</i>	19	9	11	4	13	
64	<i>Hordeum murinum</i>	19	9	12	3	13	
63	<i>Apargia hispida</i> 513	19	9	12	3	13	
62	<i>Chelidonium majus</i>	19	9	12	3	13	
61	<i>Plantago media</i>	18	10	11	4	13	
61	<i>Avena flavescens</i>	19	9	12	3	13	
61	<i>Glyceria rigida</i> 517	19	9	11	4	13	
61	<i>Arum maculatum</i>	19	9	12	3	13	
60	<i>Pyrus Malus</i> 519	19	9	12	3	13	
59	<i>Avena fatua</i> 520	18	10	10	5	13	
58	<i>Viola hirta</i> 521	18	10	12	4	12	
57	<i>Scirpus maritimus</i>	18	10	12	6	10	
57	<i>Poterium Sanguisorba</i>	19	9	12	3	13	1046
56	<i>Cistopteris fragilis</i>	11	17	10	11	7	
56	<i>Lepidium Smithii</i> 525	15	13	12	7	9	
56	<i>Ranunculus Lingua</i>	17	11	10	5	13	



Co.	28 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
55	<i>Cochlearia officinalis</i>	12	16	10	12	6	714, 813
54	<i>Avena pratensis</i>	14	14	9	8	11	371
54	<i>Trifolium minus</i>	18	10	11	4	13	
54	<i>Milium effusum</i> 430	15	13	9	8	11	
53	<i>Potamogeton oblongus</i>	13	15	10	10	8	natans
53	<i>Ænanthe Lachenalii</i>	17	11	11	5	12	pimpinelloides
53	<i>Thrinicia hirta</i> 533	19	9	12	3	13	
53	<i>Sagina apetala</i> 534	19	9	11	4	13	procumbens
52	<i>Geranium columbinum</i>	18	10	12	4	12	
52	<i>Geranium pusillum</i>	18	10	11	4	13	
52	<i>Carex intermedia</i> 537	17	11	10	6	12	arenaria
52	<i>Potamogeton pectinatus</i>	17	11	9	6	13	977, 987
50	<i>Ulmus montana</i> 539	16	12	10	7	11	
50	<i>Scirpus pauciflorus</i>	13	15	9	9	10	
50	<i>Saponaria officinalis</i>	19	9	12	3	13	
49	<i>Schoberia maritima</i>	16	12	10	8	10	
49	<i>Carduus tenuiflorus</i>	18	10	12	4	12	
43	<i>Zostera marina</i> 544	12	16	8	12	8	
40	<i>Taraxacum palustre</i>	14	14	9	8	11	officinale
36	<i>Ruppia maritima</i>	14	14	9	10	9	
27 Subprovinces.							
65	<i>Stachys Betonica</i>	17	10	11	4	12	
62	<i>Carduus nutans</i> 548	19	8	12	2	13	
62	<i>Euonymus europæus</i>	19	8	11	3	13	
61	<i>Vicia tetrasperma</i>	19	8	11	3	13	1138
60	<i>Cynoglossum officinale</i>	19	8	12	2	13	
60	<i>Hypericum Androsæmum</i>	17	10	12	5	10	
60	<i>Sedum Telephium</i>	18	9	12	3	12	
60	<i>Senecio erucifolius</i>	19	8	12	2	13	
60	<i>Galium Mollugo</i> 555	18	9	10	4	13	1000
59	<i>Valeriana dioica</i>	18	9	11	3	13	
59	<i>Paris quadrifolia</i>	16	12	9	5	13	
58	<i>Torilis nodosa</i> 558	19	8	12	2	13	
56	<i>Ballota nigra</i> 559	19	8	12	2	13	
55	<i>Polypodium Phegopteris</i>	9	18	10	12	5	
55	<i>Galium uliginosum</i>	16	11	10	5	12	
55	<i>Scabiosa columbaria</i>	19	8	12	2	13	
53	<i>Hypericum dubium</i>	16	11	12	5	10	
52	<i>Melilotus officinalis</i> 564	19	8	12	2	13	

Co.	27 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
51	<i>Sisymbrium Sophia</i>	17	10	11	5	11	
51	<i>Rumex Hydrolapathum</i>	19	8	12	2	13	
50	<i>Poa nemoralis</i>	16	11	10	6	11	1155
49	<i>Lemna trisulca</i>	17	10	10	4	13	
46	<i>Carex curta</i> 569	14	13	9	7	11	
46	<i>Geranium sanguineum</i>	13	14	11	8	8	
46	<i>Scirpus acicularis</i>	17	10	11	4	12	
45	<i>Arundo Epigejos</i>	17	10	11	4	12	
45	<i>Potamogeton lucens</i>	16	11	9	5	13	632
44	<i>Salix fragilis, etc.</i>	17	10	10	5	12	
44	<i>Anthemis arvensis</i>	17	10	9	5	13	
44	<i>Silene anglica</i> 576	17	10	11	5	11	
42	<i>Salix purpurea, etc.</i>	14	13	9	7	11	
39	<i>Carex distans</i> 578	14	13	8	10	9	212, etc.
26 Subprovinces.							
63	<i>Rosa arvensis</i> 579	18	8	11	2	13	
58	<i>Cardamine amara</i>	13	13	7	7	12	
58	<i>Anthemis Cotula</i>	18	8	10	3	13	
58	<i>Dipsacus sylvestris</i>	19	7	12	1	13	
57	<i>Genista tinctoria</i>	18	8	11	2	13	
56	<i>Ranunculus arvensis</i>	18	8	11	2	13	
55	<i>Ceterach officinarum</i>	17	9	12	4	10	
54	<i>Poa compressa</i> 586	17	9	9	4	13	
54	<i>Trifolium fragiferum</i>	19	7	11	2	13	
53	<i>Galeopsis versicolor</i>	11	15	6	9	11	Tetrahit
52	<i>Vaccinium Oxycocco</i> s	13	13	8	7	11	
52	<i>Ceanothe fistulosa</i> 590	16	10	8	5	13	
50	<i>Artemisia Absinthium</i>	18	8	12	2	12	
49	<i>Thalictrum flavum</i>	16	10	10	4	12	
49	<i>Chenopodium rubrum</i>	17	9	9	4	13	1334
48	<i>Hypericum Elodes</i>	16	10	12	5	9	
47	<i>Sambucus Ebulus</i> 595	17	9	11	3	12	
47	<i>Spiræa Filipendula</i>	17	9	10	3	13	
47	<i>Lathyrus sylvestris</i>	18	8	11	5	10	
46	<i>Apium graveolens</i>	18	8	12	4	10	
45	<i>Trifolium striatum</i>	17	9	11	3	12	
45	<i>Matricaria Chamomilla</i>	18	8	11	2	13	
44	<i>Viola flavicornis</i> 601	16	10	9	4	13	sylvatica
43	<i>Sagina maritima</i>	11	15	9	11	6	procumbens

Co.	26 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
43	<i>Salsola Kali</i> 603	14	12	9	8	9	
42	<i>Potamogeton heterophyl.</i>	11	15	7	9	10	1079?
40	<i>Sinapis alba</i> 605	15	11	9	6	11	
36	<i>Callitriche pedunculata</i>	12	14	9	8	9	verna
25 Subprovinces.							
63	<i>Tamus communis</i> 607	19	6	12	-	13	
56	<i>Verbena officinalis</i>	19	6	12	-	13	
54	<i>Empetrum nigrum</i>	7	18	9	12	4	
54	<i>Serratula tinctoria</i>	17	8	12	2	11	
54	<i>Cornus sanguinea</i>	19	6	12	-	13	
53	<i>Erigeron acris</i> 612	18	7	11	1	13	
52	<i>Hordeum pratense</i>	18	7	10	2	13	
52	<i>Reseda lutea</i> 614	18	7	9	3	13	
51	<i>Aquilegia vulgaris</i>	17	8	12	2	11	
49	<i>Scutellaria minor</i>	16	9	12	3	10	
48	<i>Salvia verbenaca</i>	18	7	10	2	13	
47	<i>Teesdalia nudicaulis</i>	14	11	8	5	12	
47	<i>Convallaria majalis</i>	15	10	8	4	13	
45	<i>Calamintha officinalis</i>	19	6	12	-	13	908, 1397
43	<i>Juncus maritimus</i>	14	11	9	7	9	
42	<i>Sedum anglicum</i> 622	13	12	9	9	7	
41	<i>Vicia lathyroides</i>	12	13	8	7	10	
41	<i>Drosera intermedia</i>	17	8	10	3	12	
40	<i>Habenaria chlorantha</i>	16	9	9	4	12	bifolia
40	<i>Asplenium marinum</i>	9	16	9	12	4	
35	<i>Festuca rubra</i> 627	13	12	9	8	8	ovina
35	<i>Carex extensa</i> 628	12	13	9	9	7	
35	<i>Veronica Buxbaumii</i>	16	9	9	4	12	
35	<i>Anagallis cærulea</i> 630	17	8	10	2	13	arvensis
33	<i>Myriophyllum alterniflor.</i>	12	13	8	7	10	spicatum
29	<i>Potamogeton rufescens</i>	12	13	9	7	9	lucens
24 Subprovinces.							
60	<i>Scrophularia Balbisii</i>	19	5	11	-	13	1053
54	<i>Humulus Lupulus</i>	18	6	11	-	13	
53	<i>Chrysosplenium alternifol.</i>	12	12	9	7	8	
53	<i>Silva pratensis</i> 636	17	7	10	1	13	
52	<i>Campanula latifolia</i>	9	14	7	8	9	
50	<i>Saxifraga granulata</i>	12	12	7	6	11	
50	<i>Lactuca muralis</i> 639	18	6	12	-	12	

Co.	24 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
50	<i>Viola odorata</i> 640	17	7	11	-	13	
50	<i>Acer campestre</i>	18	6	11	-	13	
50	<i>Helminthia echioides</i>	19	5	11	-	13	
49	<i>Sagittaria sagittifolia</i>	17	7	10	1	13	
49	<i>Trifolium scabrum</i>	17	7	10	3	11	
49	<i>Orchis Morio</i> 645	18	6	11	-	13	
48	<i>Linaria minor</i>	18	6	9	2	13	
45	<i>Pyrola minor</i> 647	10	14	6	9	9	
45	<i>Lathræa squamaria</i>	14	10	9	4	11	
44	<i>Epipactis palustris</i>	15	9	9	3	12	
44	<i>Potamogeton densus</i>	17	7	9	2	13	
44	<i>Nasturtium sylvestre</i>	16	8	10	3	11	
44	<i>Nepeta cataria</i> 652	18	6	9	2	13	
41	<i>Pyrus Aria</i> , etc.	17	7	9	2	13	
40	<i>Salix triandra</i> , etc.	16	8	9	3	12	
40	<i>Cerastium arvense</i>	13	11	7	5	12	
40	<i>Sinapis nigra</i> 656	19	5	11	1	12	
38	<i>Glyceria distans</i>	15	9	9	3	12	1217
38	<i>Marrubium vulgare</i>	18	6	11	2	11	
35	<i>Sinapis tenuifolia</i> 659	17	7	12	2	10	
29	<i>Eriophorum latifolium</i>	11	13	7	7	10	angustifolium
23 Subprovinces.							
55	<i>Spiranthes autumnalis</i>	18	5	12	-	11	
54	<i>Polypodium Dryopteris</i>	7	16	8	10	5	951
54	<i>Ligustrum vulgare</i>	19	4	10	-	13	
53	<i>Lysimachia nummularia</i>	18	5	11	-	12	
50	<i>Inula Conyza</i> 665	18	5	12	-	11	
49	<i>Ulex nanus</i> , etc.	17	6	12	1	10	
49	<i>Solanum nigrum</i> 667	17	6	10	1	12	
48	<i>Lamium Galeobdolon</i>	19	4	11	-	12	
47	<i>Ranunculus parviflorus</i>	18	5	10	-	13	
47	<i>Butomus umbellatus</i>	18	5	10	-	13	
47	<i>Sison Amomum</i> 671	19	4	11	-	12	
46	<i>Cotyledon Umbilicus</i>	15	8	12	4	7	
46	<i>Rhamnus Frangula</i>	18	5	12	-	11	
45	<i>Daphne Laureola</i>	16	7	7	3	13	
44	<i>Orobanche "major"</i>	17	6	10	1	12	
43	<i>Rubus saxatilis</i> 676	4	19	6	13	4	
43	<i>Stellaria glauca</i>	15	8	7	3	13	



Co.	23 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
41	<i>Eryngium maritimum</i>	12	11	9	8	6	
41	<i>Campanula Trachelium</i>	17	6	10	3	10	
41	<i>Typha angustifolia</i> 680	16	7	8	2	13	
40	<i>Lycopodium inundatum</i>	14	9	8	4	11	
39	<i>Pieris hieracioides</i> 682	19	4	10	-	13	
37	<i>Onopordum Acanthium</i>	16	7	9	2	12	
37	<i>Blysmus compressus</i>	15	8	9	2	12	
37	<i>Centunculus minimus</i>	15	8	9	4	10	
35	<i>Myosotis repens</i> 686	10	13	7	8	8	palustris
32	<i>Carex teretiuscula</i>	13	10	8	6	9	paniculata
22 Subprovinces.							
50	<i>Viola lutea</i> 688	6	16	8	10	4	tricolor
50	<i>Alopecurus agrestis</i>	16	6	9	-	13	
49	<i>Sanguisorba officinalis</i>	14	8	11	2	9	
47	<i>Orchis pyramidalis</i> 691	17	5	8	1	13	
46	<i>Rhamnus catharticus</i>	17	5	9	-	13	
46	<i>Cerastium aquaticum</i>	18	4	10	-	12	
46	<i>Ophrys apifera</i> 694	18	4	9	-	13	1368
43	<i>Narcissus pseudo-Narciss.</i>	17	5	11	-	11	
42	<i>Campanula glomerata</i>	14	8	7	3	12	
42	<i>Torilis infesta</i> 697	18	4	10	-	12	
41	<i>Glaucium luteum</i>	13	9	10	5	7	
40	<i>Lycopodium alpinum</i>	4	18	6	12	4	
40	<i>Ribes rubrum</i> 700	13	9	10	3	9	
39	<i>Iris foetidissima</i>	18	4	10	-	12	
38	<i>Allosorus crispus</i>	6	16	8	11	3	
38	<i>Mentha piperita</i> 703	12	10	10	4	8	
38	<i>Lemna polyrhiza</i>	16	6	8	2	12	
37	<i>Anthemis nobilis</i>	16	6	10	2	10	
36	<i>Hydrocharis Morsus-ranæ</i>	17	5	9	-	13	
35	<i>Smyrnum Olusatrum</i>	14	8	9	4	9	
35	<i>Ceratophyllum demersum</i>	15	7	8	3	11	1062
35	<i>Juncus obtusiflorus</i> 709	15	7	8	2	12	
35	<i>Dianthus deltoides</i>	12	10	8	4	10	
34	<i>Lepturus filiformis</i>	16	6	10	2	10	
34	<i>Phleum arenarium</i>	15	7	9	3	10	
32	<i>Beta maritima</i> 713	15	7	9	5	8	
32	<i>Cochlearia danica</i>	12	10	9	7	6	officinalis
32	<i>Hippocrepis comosa</i>	17	5	9	1	12	

Co.	22 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
31	<i>Convolvulus Soldanella</i>	14	8	9	5	8	
30	<i>Potamogeton gramineus</i>	13	9	6	4	12	pusillus
26	<i>Scirpus glaucus</i> 718	14	8	7	7	8	lacustris
21 Subprovinces.							
51	<i>Chlora perfoliata</i>	17	4	9	-	12	
50	<i>Bryonia dioica</i> 720	16	5	8	-	13	
45	<i>Myrrhis odorata</i>	6	15	8	9	4	
44	<i>Listera cordata</i> 722	5	16	6	10	5	
44	<i>Oenanthe Phellandrium</i>	14	7	7	1	13	969
44	<i>Euphorbia amygdaloides</i>	19	2	10	-	11	
44	<i>Linaria Elatine</i> 725	18	3	10	-	11	
43	<i>Vaccinium Vitis-idæa</i>	5	16	7	10	4	
43	<i>Pastinaca sativa</i>	17	4	9	1	11	
41	<i>Polystichum angulare</i>	15	6	11	1	9	aculeatum
41	<i>Hottonia palustris</i> 729	15	6	8	-	13	
40	<i>Potentilla argentea</i>	13	8	6	4	11	
40	<i>Ulmus campestris, etc.</i>	17	4	9	-	12	
39	<i>Pyrethrum maritimum</i>	8	13	8	9	4	inodorum
37	<i>Mentha Pulegium</i>	16	5	10	-	11	
37	<i>Mentha sylvestris</i> 734	17	4	9	1	11	
36	<i>Artemisia maritima</i>	14	7	9	3	9	
35	<i>Sagina subulata</i>	9	12	7	10	4	saxatilis
35	<i>Mœnchia erecta</i>	17	4	10	-	11	
34	<i>Carex lævigata</i> 738	12	9	9	5	7	distans
32	<i>Polygonum minus</i>	15	6	8	1	12	1122
32	<i>Sium latifolium</i>	17	4	8	1	12	
30	<i>Berberis vulgaris</i> 741	12	9	7	4	10	
30	<i>Festuca pseudo-myurus</i>	17	4	10	-	11	bromoides
27	<i>Centaurea "nigrescens"</i>	14	7	10	3	8	nigra
27	<i>Ranunculus circinatus</i>	15	6	7	1	13	aquatilis
20 Subprovinces.							
49	<i>Trollius europæus</i>	3	17	5	11	4	
35	<i>Carex divulsa</i> 746	16	4	8	1	11	muricata
35	<i>Pyrus torminalis</i>	18	2	11	-	9	
33	<i>Hymenophyllum Wilsoni</i>	6	14	8	11	1	tunbridgense
33	<i>Drosera anglica</i> 749	4	16	4	11	5	
33	<i>Carduus eriophorus</i>	16	4	8	-	12	
30	<i>Mentha rotundifolia</i>	16	4	10	1	9	
30	<i>Atropa Belladonna</i> 750	14	6	9	-	11	

Co.	20 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
30	<i>Brassica campestris</i>	16	4	10	-	10	
30	<i>Rosa rubiginosa</i> , etc.	17	3	9	-	11	
30	<i>Inula Helenium</i> 755	16	4	11	-	9	
30	<i>Mercurialis annua</i>	17	3	10	1	9	
30	<i>Fagus sylvatica</i> 757	16	4	9	-	11	
29	<i>Statice Limonium</i>	15	5	9	1	10	971
28	<i>Crambe maritima</i>	14	6	8	4	8	
27	<i>Polygonum Raii</i> 760	11	9	9	7	4	maritimum
25	<i>Anchusa sempervirens</i>	16	4	10	-	10	
19 Subprovinces.							
43	<i>Crepis paludosa</i> 761	3	16	5	10	4	
42	<i>Lycopodium selaginoides</i>	1	18	3	12	4	
40	<i>Specularia hybrida</i>	15	4	7	-	12	
39	<i>Prunus Padus</i> 765	4	15	6	9	4	
39	<i>Carduus pratensis</i>	16	3	8	-	11	
37	<i>Pimpinella magna</i>	13	6	6	1	12	
37	<i>Carex Pseudo-cyperus</i>	15	4	8	-	11	
35	<i>Saxifraga hypnoides</i>	5	14	6	10	3	
35	<i>Ophrys muscifera</i> 770	15	4	7	-	12	
34	<i>Hypericum montanum</i>	13	6	11	-	8	
34	<i>Wahlenbergia hederacea</i>	15	4	12	1	6	
34	<i>Chenopodium polysperm.</i>	16	3	9	-	10	
33	<i>Viscum album</i> 774	15	4	8	-	11	
32	<i>Atriplex littoralis</i>	12	7	6	3	10	hastata
32	<i>Equisetum hyemale</i>	7	12	5	6	8	
32	<i>Lemna gibba</i> 777	15	4	7	1	11	
32	<i>Bromus erectus</i>	14	5	6	2	11	
32	<i>Chenopodium murale</i>	15	4	8	-	11	
31	<i>Orchis ustulata</i> 780	14	5	6	-	13	
30	<i>Lastrea Thelypteris</i>	13	6	7	1	11	
30	<i>Dianthus Armeria</i>	13	6	8	2	9	
30	<i>Medicago maculata</i>	16	3	8	-	11	
29	<i>Myosotis sylvatica</i>	10	9	6	3	10	1275
28	<i>Erythræa littoralis</i> 785	8	11	8	8	3	Centaurium
28	<i>Monotropa Hypopitys</i>	13	6	7	1	11	
27	<i>Ranunculus fluitans</i>	15	4	8	1	10	aquatilis
26	<i>Glyceria loliacea</i> 788	13	6	8	3	8	
26	<i>Populus alba</i> , etc.	15	4	8	-	11	
25	<i>Atriplex portulacoides</i>	14	5	8	1	10	

Co.	18 Subprovinces.	S.	N.	W.	Sc.	E.	Bentham.
41	<i>Clematis Vitalba</i> 791	17	1	9	-	9	
36	<i>Carduus heterophyllus</i>	3	15	5	10	3	
35	<i>Myosurus minimus</i>	13	5	6	-	12	
35	<i>Viburnum Lantana</i>	15	3	7	-	11	
35	<i>Linaria spuria</i> 795	16	2	7	-	11	
34	<i>Salix pentandra</i> 796	4	14	6	8	4	
34	<i>Galium boreale</i> 797	2	16	3	12	3	
34	<i>Rumex pulcher</i> 798	17	1	8	-	10	
33	<i>Stellaria nemorum</i>	5	13	7	7	4	
33	<i>Nasturtium amphibium</i>	14	4	7	-	11	
31	<i>Colchicum autumnale</i>	12	6	9	-	9	
31	<i>Asperula cynanchica</i>	15	3	9	-	9	
31	<i>Galium tricornis</i> 803	14	4	5	-	13	
29	<i>Erythræa pulchella</i>	15	3	8	1	9	Centaurium
28	<i>Carex strigosa</i> 805	15	3	8	-	10	
28	<i>Geranium pyrenaicum</i>	16	2	9	-	9	
28	<i>Cuscuta Epithymum</i>	15	3	8	-	10	998
28	<i>Onobrychis sativa</i> 807	15	3	7	-	11	
27	<i>Trifolium subterraneum</i>	15	3	8	-	10	
26	<i>Cladium Mariscus</i>	11	7	7	2	9	
26	<i>Allium oleraceum</i>	11	7	5	2	11	
25	<i>Carex filiformis</i> 812	6	12	5	6	7	
24	<i>Cochlearia anglica</i>	15	3	10	1	7	officinalis
23	<i>Malaxis paludosa</i>	8	10	3	7	8	
17 Subprovinces.							
37	<i>Habenaria albida</i> 815	3	14	4	9	4	
35	<i>Bupleurum rotundifolium</i>	13	4	4	-	13	
34	<i>Verbascum nigrum</i>	16	1	8	-	9	
33	<i>Taxus baccata</i> 818	12	5	9	-	8	
33	<i>Antirrhinum Orontium</i>	17	-	9	-	8	
32	<i>Lactuca virosa</i> 820	11	6	3	2	12	Scariola
32	<i>Brachypodium pinnatum</i>	14	3	5	-	12	
32	<i>Lathyrus Nissolia</i>	16	1	7	-	10	
31	<i>Turritis glabra</i> 823	9	8	4	3	10	
31	<i>Carduus acaulis</i>	16	1	7	-	10	
30	<i>Lastrea spinulosa</i>	11	6	7	1	9	dilatata
30	<i>Papaver hybridum</i>	15	2	8	-	9	
29	<i>Chenopodium olidum</i>	12	5	5	1	11	
29	<i>Myriophyllum verticillatum</i>	12	5	5	-	12	



Co.	17 Sps. cont.	S.	N.	W.	Sc.	E.	Benth.
28	<i>Astragalus hypoglottis</i>	8	9	2	6	9	
27	<i>Pyrus communis</i> 830	14	3	6	-	11	
26	<i>Hypochæris glabra</i>	11	6	5	3	9	
25	<i>Limosella aquatica</i>	11	6	5	1	11	
25	<i>Convallaria multiflora</i>	11	6	5	1	11	
25	<i>Epilobium roseum</i>	11	6	7	3	7	1251
22	<i>Rubus carpinifolius</i>	10	7	8	4	5	fruticosus
22	<i>Rubus plicatus</i> 836	9	8	8	4	5	fruticosus
22	<i>Salix rubra</i> , etc.	10	7	5	2	10	purpurea
22	<i>Glyceria plicata</i>	11	6	6	2	9	fluitans
22	<i>Trigonella ornithopodioid.</i>	12	5	8	3	6	
20	<i>Rubus cæsius</i> 840	13	4	7	1	9	
20	<i>Cicuta virosa</i> 841	10	7	3	5	9	
16 Subprovinces.							
40	<i>Dipsacus pilosus</i> 842	14	2	6	-	10	
37	<i>Geranium sylvaticum</i>	2	14	4	8	4	
30	<i>Helleborus viridis</i>	12	4	5	-	11	
30	<i>Petroselinum segetum</i>	15	1	7	-	9	
30	<i>Orobanche minor</i>	14	2	6	-	10	1047, etc.
29	<i>Erodium maritimum</i>	12	4	12	1	3	
28	<i>Melica nutans</i> 848	3	13	4	8	4	
26	<i>Sedum Rhodiola</i>	1	15	2	12	2	
25	<i>Carex limosa</i> 850	5	11	5	7	4	1089, 1354
25	<i>Ranunculus cœnosus</i>	10	6	8	2	6	aquatilis
25	<i>Rubus corylifolius</i>	12	4	8	1	7	fruticosus
25	<i>Asplenium viride</i>	3	13	4	9	3	Trichomanes
25	<i>Acorus Calamus</i> 854	12	4	7	-	9	
25	<i>Arundo Calamagrostis</i>	11	5	4	-	12	
25	<i>Lobelia Dortmanna</i>	4	12	5	-	11	
23	<i>Gagea lutea</i> 857	5	11	5	5	6	
22	<i>Rumex palustris</i>	13	3	8	-	8	maritimus
21	<i>Senecio viscosus</i>	7	9	3	6	7	
21	<i>Arenaria tenuifolia</i>	15	1	7	-	9	
20	<i>Rubus macrophyllus</i>	11	5	8	2	6	fruticosus
15 Subprovinces.							
30	<i>Ribes Grossularia</i>	10	5	7	?	8	
29	<i>Helleborus fœtidus</i>	12	3	5	-	10	
27	<i>Blysmus rufus</i> 864	1	14	2	12	1	
25	<i>Arenaria verna</i> 865	4	11	6	6	3	1333

Co.	15 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
25	<i>Gentiana Pneumonanthe</i>	10	5	5	-	10	
24	<i>Pyrola media</i> 867	2	13	2	10	3	
24	<i>Hordeum maritimum</i>	12	3	6	-	9	
24	<i>Ruscus aculeatus</i>	11	4	4	-	11	
23	<i>Elymus arenarius</i>	6	9	3	7	5	
23	<i>Hieracium pallidum</i>	3	12	4	9	2	murorum
23	<i>Thalictrum alpinum</i>	1	14	2	11	2	
21	<i>Scilla verna</i> 873	5	10	6	8	1	
21	<i>Carex stricta</i> 874	8	7	5	3	7	vulgaris
20	<i>Cephalanthera ensifolia</i>	8	7	5	3	7	
20	<i>Rubus discolor</i> 876	13	2	7	-	8	fruticosus
20	<i>Fumaria micrantha</i>	9	6	4	4	7	officinalis
20	<i>Scirpus Savii</i> 878	9	6	9	4	2	
19	<i>Potentilla verna</i>	7	8	7	3	5	1111
19	<i>Andromeda polifolia</i>	7	8	7	3	5	
19	<i>Lastrea fœnisecii</i>	8	7	7	4	4	dilatata
17	<i>Prunus Cerasus</i> 882	12	3	8	-	7	452
14 Subprovinces.							
30	<i>Saxifraga stellaris</i>	1	13	2	10	2	
27	<i>Silene noctiflora</i> 884	7	7	1	3	10	
27	<i>Erysimum cheiranthoides</i>	14	-	7	-	7	
26	<i>Rubus Chamæmorus</i>	1	13	3	8	3	
25	<i>Mertensia maritima</i>	1	13	2	12	-	
23	<i>Salix herbacea</i> 888	2	12	3	10	1	
22	<i>Saxifraga oppositifolia</i>	2	12	3	10	1	
22	<i>Lathyrus Aphaca</i>	14	-	5	-	9	
21	<i>Carex axillaris</i>	10	4	5	-	9	1092
20	<i>Ribes nigrum</i> 892	10	4	6	-	8	
19	<i>Rubus rudis</i> 893	10	4	7	2	5	fruticosus
18	<i>Linaria repens</i>	11	3	7	-	7	
18	<i>Althæa officinalis</i>	14	-	6	?	8	
17	<i>Hieracium tridentatum</i>	8	6	5	-	9	boreale
17	<i>Glyceria procumbens</i>	11	3	6	-	8	
17	<i>Potamogeton compressus</i>	10	4	5	-	9	pusillus
17	<i>Fedia Auricula</i> 899	12	2	8	1	5	
16	<i>Potamogeton plantagin.</i>	7	7	3	2	9	natans
15	<i>Potamogeton prælongus</i>	7	7	2	4	8	

Co.	13 Subprovinces.	S.	N.	W.	Sc.	E.	Bentham.
25	<i>Arbutus Uva-ursi</i> 902	-	13	1	10	2	
25	<i>Euphorbia Paralias</i>	11	2	9	-	4	
24	<i>Crithmum maritimum</i>	10	3	8	2	3	
22	<i>Rubus suberectus</i> 905	6	7	5	4	4	fruticosus
21	<i>Campanula patula</i>	10	3	6	-	7	
21	<i>Linum angustifolium</i>	11	2	10	-	3	
21	<i>Calamintha Nepeta</i>	13	-	6	-	7	officinalis
20	<i>Rubus leucostachys</i>	10	3	8	-	5	fruticosus
20	<i>Rumex pratensis</i>	11	2	6	-	7	crispus
20	<i>Rumex aquaticus</i>	-	13	1	9	3	
20	<i>Carex divisa</i> 912	12	1	6	-	7	
20	<i>Bupleurum tenuissimum</i>	11	2	5	-	8	
19	<i>Caucalis daucoides</i>	10	3	3	-	10	
18	<i>Rubus affinis</i> 915	7	6	6	3	4	fruticosus
18	<i>Festuca uniglumis</i>	11	2	7	-	6	
16	<i>Rubus rhamnifolius</i>	9	4	7	1	5	fruticosus
16	<i>Epipactis media</i> 918	8	5	4	1	8	latifolia
16	<i>Inula crithmoides</i>	12	1	8	1	4	
16	<i>Lepidium ruderales</i>	13	-	8	-	5	
15	<i>Rubus Radula</i> 921	9	4	6	2	5	fruticosus
15	<i>Vicia bithynica</i>	12	1	9	-	4	
14	<i>Rubus nemorosus</i>	9	4	5	1	7	fruticosus
12 Subprovinces.							
26	<i>Euphorbia platyphyllos</i>	10	2	5	-	7	1300
25	<i>Polygonum viviparum</i>	1	11	2	8	2	
25	<i>Saxifraga aizoides</i> 926	-	12	1	9	2	
24	<i>Cephalanthera grandiflor.</i>	10	2	5	-	7	
23	<i>Rumex maritimus</i>	11	1	5	-	7	858
22	<i>Hordeum sylvaticum</i>	7	5	3	-	9	
20	<i>Ribes alpinum</i> 930	4	8	6	2	4	
20	<i>Sedum reflexum</i>	11	1	8	-	4	rupestre
20	<i>Carex rigida</i> 932	1	11	2	9	1	vulgaris
20	<i>Chenopodium urbicum</i>	9	3	4	-	8	
20	<i>Carpinus Betulus</i>	11	1	5	-	7	
20	<i>Cuscuta europæa</i>	11	1	5	-	7	
19	<i>Tilia parvifolia</i> 936	10	2	7	-	5	
19	<i>Ligusticum scoticum</i>	-	12	-	11	1	
19	<i>Thesium humifusum</i>	12	-	4	-	8	
18	<i>Gastridium lendigerum</i>	12	-	7	-	5	

Co.	12 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
18	<i>Silene acaulis</i> 940	1	11	2	10	-	
18	<i>Rubia peregrina</i>	12	-	9	-	3	
18	<i>Fritillaria Meleagris</i>	12	-	5	-	7	
17	<i>Senecio saracenicus</i> ?	5	7	5	4	3	
17	<i>Rubus nitidus</i> 944	8	4	5	1	6	fruticosus
17	<i>Hymenophyllum tunbridg.</i>	7	5	6	3	3	748
17	<i>Draba incana</i> 946	1	11	2	7	3	
17	<i>Juncus diffusus</i>	7	5	2	?	10	glaucus
17	<i>Orobanche "elatior"</i>	11	1	3	-	9	
16	<i>Pyrola rotundifolia</i>	5	7	3	3	6	
15	<i>Rubus pallidus</i> 950	6	6	5	2	5	fruticosus
15	<i>Polypodium calcareum</i>	7	5	8	-	4	Dryopteris
15	<i>Rubus Koeblersi</i> 952	8	4	8	1	3	fruticosus
15	<i>Sinapis muralis</i>	11	1	6	-	6	
13	<i>Elatine hexandra</i>	7	5	5	3	4	
11 Subprovinces.							
25	<i>Trientalis europæa</i>	-	11	1	7	3	
22	<i>Fœniculum vulgare</i>	11	-	7	-	4	
21	<i>Luzula Forsteri</i> 957	11	-	6	-	5	pilosa
20	<i>Circæa alpina</i> 958	1	10	2	8	1	
20	<i>Pinguicula lusitanica</i>	5	6	5	5	1	
18	<i>Vinca minor</i> 960	11	-	4	-	7	
17	<i>Juncus triglumis</i>	1	10	2	7	2	biglumis
17	<i>Herminium Monorchis</i>	11	-	3	-	8	
16	<i>Rubus villicaulis</i> 963	8	3	7	-	4	fruticosus
16	<i>Galium pusillum</i>	3	8	4	4	3	saxatile
16	<i>Saussurea alpina</i>	1	10	2	9	-	
15	<i>Equisetum variegatum</i>	2	9	4	5	2	
15	<i>Rubus glandulosus</i>	8	3	6	-	5	fruticosus
15	<i>Raphanus maritimus</i>	6	5	7	3	1	Raphanistrum
15	<i>Œnanthe fluviatilis</i> 969	10	1	4	-	7	Phellandrium
15	<i>Geranium rotundifolium</i>	11	-	5	-	6	
14	<i>Statice bahusiensis</i>	7	4	4	1	6	Limonium
14	<i>Festuca sylvatica</i>	5	6	5	3	3	
13	<i>Rubus fusco-ater</i>	8	3	7	-	4	fruticosus
13	<i>Melilotus vulgaris</i>	9	2	6	-	5	
13	<i>Juniperus nana</i> 975	1	10	2	7	2	communis
13	<i>Medicago denticulata</i>	9	2	4	-	7	
11	<i>Potamogeton filiformis</i>	3	8	2	4	5	pectinatus



Co.	10 Subprovinces.	S.	N.	W.	Sc.	E.	Benth.
?	<i>Triticum laxum</i> 978	6	4	1	2	7	repens
24	<i>Sedum villosum</i> 979	-	10	1	7	2	
22	<i>Alchemilla alpina</i>	-	10	1	8	1	
20	<i>Vicia Orobus</i> 981	3	7	4	6	?	
19	<i>Meum Athamanticum</i>	1	9	2	6	2	
18	<i>Carex pauciflora</i>	-	10	-	8	2	
17	<i>Salix phylicifolia</i> , etc.	-	10	2	6	2	1035, 1224
17	<i>Bartsia viscosa</i> 985	6	4	5	3	2	
16	<i>Epilobium alsinifolium</i>	1	9	2	6	2	
16	<i>Potamogeton flabellatus</i>	8	2	4	-	6	pectinatus
16	<i>Melampyrum sylvaticum</i>	-	10	1	7	2	
16	<i>Euphorbia portlandica</i>	7	3	8	1	1	
16	<i>Vaccinium uliginosum</i>	-	10	1	8	1	
15	<i>Lycopodium annotinum</i>	1	9	2	7	1	
15	<i>Lamium intermedium</i>	-	10	?	10	?	amplexicaule
14	<i>Luzula spicata</i> 993	1	9	2	8	-	
14	<i>Polystichum Lonchitis</i>	1	9	1	7	2	
13	<i>Rubus Sprengelii</i>	6	4	6	-	4	fruticosus
13	<i>Rubus Hystrix</i> 996	8	2	5	-	5	fruticosus
12	<i>Equisetum umbrosum</i>	-	10	1	7	2	
11	<i>Cuscuta Trifolii</i>	7	3	2	-	8	Epithymum
9 Subprovinces.							
?	<i>Sparganium minimum</i>	4	5	1	4	4	natans
20	<i>Galium erectum</i> 1000	7	2	1	-	8	Mollugo
18	<i>Oxyria reniformis</i>	1	8	2	7	-	
18	<i>Chenopodium hybridum</i>	9	-	4	-	5	
18	<i>Pulicaria vulgaris</i>	9	-	2	-	7	
17	<i>Apera Spica-venti</i>	9	-	-	-	9	1332
16	<i>Rosa systyla</i> 1005	9	-	5	-	4	arvensis?
15	<i>Silene nutans</i> 1006	5	4	3	2	4	
15	<i>Anemone Pulsatilla</i>	7	2	1	-	8	
15	<i>Cineraria campestris</i>	9	-	3	-	6	
15	<i>Centaurea Calcitrapa</i>	9	-	3	-	6	
15	<i>Azalea procumbens</i>	-	9	-	9	-	
14	<i>Dryas octopetala</i>	2	7	2	6	1	
14	<i>Cardamine impatiens</i>	6	3	5	-	4	
13	<i>Chenopodium ficifolium</i>	7	2	1	-	8	album
12	<i>Salix Lapponum</i> 1014	-	9	-	8	1	
12	<i>Asplenium lanceolatum</i>	9	-	7	-	2	

Co.	9 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
12	<i>Tofieldia palustris</i>	-	9	-	7	2	
12	<i>Juncus acutus</i> 1017	9	-	6	-	3	
12	<i>Coronopus didyma</i>	9	-	7	-	2	
11	<i>Scirpus uniglumis</i>	2	7	2	5	2	palustris
11	<i>Lathyrus palustris</i>	8	1	4	-	5	
11	<i>Hutchinsia petræa</i>	7	2	7	-	2	
11	<i>Brassica oleracea</i>	9	-	7	-	2	
11	<i>Linum perenne</i> 1023	5	4	?	-	9	
11	<i>Alopecurus bulbosus</i>	9	-	4	-	5	geniculatus
10	<i>Lavatera arborea</i>	7	2	8	1	-	
10	<i>Daucus maritimus</i>	9	-	6	-	3	Carota
10	<i>Trifolium suffocatum</i>	9	-	4	-	5	
10	<i>Trifolium glomeratum</i>	9	-	4	-	5	
9	<i>Stachys ambigua</i> 1029	4	5	2	2	5	palustris
9	<i>Atriplex arenaria</i>	3	6	2	4	3	
9	<i>Galeopsis ochroleuca</i>	4	5	3	-	6	
9	<i>Asparagus officinalis</i> ?	8	1	9	-	-	
8 Subprovinces.							
?	<i>Sparganium natans</i>	2	6	1	5	2	999
17	<i>Isoetes lacustris</i> 1034	2	6	3	5	-	
16	<i>Salix nigricans</i>	-	8	1	5	2	phylicifolia
16	<i>Sinapis monensis</i>	2	6	4	4	-	
15	<i>Symphytum tuberosum</i>	1	7	-	5	3	
14	<i>Sibbaldia procumbens</i>	-	8	-	8	-	
14	<i>Stratiotes aloides</i> 1039	4	4	1	-	7	
13	<i>Allium Scorodoprasum</i>	-	8	2	3	3	
13	<i>Subularia aquatica</i>	1	7	2	6	-	
12	<i>Poa alpina</i> 1042	1	7	2	5	1	
12	<i>Daphne Mezereum</i>	5	3	2	-	6	
12	<i>Aceras anthropophora</i>	8	-	-	-	8	
11	<i>Hieracium rigidum</i>	-	8	1	5	2	boreale
11	<i>Poterium muricatum</i>	8	-	2	-	6	Sanguisorba
11	<i>Orobanche hederæ</i>	8	-	7	-	1	minor
11	<i>Alopecurus fulvus</i>	8	-	3	-	5	geniculatus
11	<i>Cornus suecica</i> 1049	-	8	-	6	2	
11	<i>Sedum rupestre</i>	7	1	7	1	-	931, 1214
11	<i>Verbascum Lychnitis</i>	8	-	4	-	4	
11	<i>Oenanthe pimpinelloides</i>	8	-	5	-	3	432, 1070
10	<i>Scrophularia Ehrharti</i>	5	3	4	1	3	Balbisi

Co.	8 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
10	<i>Utricularia intermedia</i>	2	6	3	4	1	minor
10	<i>Hieracium strictum</i>	-	8	1	6	1	boreale
10	<i>Arabis petræa</i> 1056	1	7	1	7	-	
10	<i>Betula nana</i> 1057	-	8	-	7	1	
9	<i>Saxifraga Hirculus</i>	-	8	2	4	2	
9	<i>Veronica humifusa</i>	1	7	2	5	1	serpyllifolia
9	<i>Lysimachia thyrsoiflora</i>	-	8	-	5	3	
9	<i>Filago apiculata</i>	7	1	1	-	7	germanica
9	<i>Ceratophyllum submersum</i>	7	1	2	1	5	demersum
9	<i>Vicia lutea</i> 1063	5	3	3	3	2	
9	<i>Spartina stricta</i>	8	-	1	-	7	1399
8	<i>Agrimonia odorata</i>	7	1	5	-	3	Eupatoria
8	<i>Statice Dodartii</i> 1066	7	1	7	-	1	1095
7 Subprovinces,							
16	<i>Meconopsis cambrica</i>	5	2	6	-	1	
15	<i>Carum verticillatum</i>	3	4	4	3	-	
14	<i>Pyrola secunda</i> 1069	-	7	1	5	1	
13	<i>Oenanthe silaifolia</i>	6	1	2	-	5	pimpinelloides
13	<i>Filago spathulata</i>	7	-	1	-	6	germanica
12	<i>Rubus thyrsoides</i>	6	1	4	-	3	fruticosus
11	<i>Actinocarpus Damasonium</i>	7	-	1	-	6	
11	<i>Adonis autumnalis</i>	7	-	1	-	6	
11	<i>Juncus trifidus</i> 1075	-	7	-	7	-	
11	<i>Frankenia lævis</i>	7	-	-	-	7	
10	<i>Asplenium septentrionale</i>	3	4	4	2	1	
10	<i>Thalictrum majus</i> (Sm.)	-	7	1	3	3	minus
10	<i>Potamogeton zosteræfolius</i>	4	3	2	2	3	heterophyllus
10	<i>Euphorbia Peplis</i> 1080	7	-	6	-	1	
9	<i>Lepidium latifolium</i>	5	2	2	-	5	
9	<i>Carex capillaris</i>	-	7	-	5	2	
9	<i>Carex digitata</i> 1083	4	3	4	-	3	
9	<i>Arbutus alpina</i>	-	7	-	7	-	
9	<i>Peucedanum palustre</i>	5	2	1	-	6	
9	<i>Melittis Melissophyllum</i>	7	-	5	-	2	
9	<i>Pinus sylvestris</i>	-	7	?	7	?	
9	<i>Agrotis setacea</i>	7	-	5	-	2	
8	<i>Carex irrigua</i> 1089	1	6	2	4	1	limosa
8	<i>Convallaria Polygonatum</i>	5	2	5	-	2	
8	<i>Bromus madritensis</i>	7	-	5	-	2	

Co.	7 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham,
8	<i>Carex Boenninghausenia</i>	4	3	-	3	4	<i>axillaris</i>
8	<i>Melilotus arvensis</i>	6	1	1	-	6	
7	<i>Salix</i> "ambigua" 1094	2	5	-	5	2	..... ?
7	<i>Statice occidentalis</i>	5	2	4	1	2	<i>Dodartii</i>
7	<i>Lathyrus maritimus</i>	5	2	1	2	4	
6 Subprovinces.							
13	<i>Campanula Rapunculus</i>	6	-	3	-	3	
13	<i>Carex incurva</i> 1098	-	6	-	6	-	
13	<i>Epilobium alpinum</i>	-	6	-	6	-	
12	<i>Hieracium argenteum</i>	1	5	2	3	1	<i>murorum</i>
12	<i>Verbascum Blattaria</i>	6	-	3	-	3	
12	<i>Linnæa borealis</i> 1102	-	6	-	5	1	
12	<i>Arnoseris pusilla</i>	6	-	-	-	6	
12	<i>Gnaphalium supinum</i>	-	6	-	6	-	
11	<i>Villarsia nymphaeoides</i>	6	-	1	-	5	
11	<i>Carex pulla</i> 1106	-	6	-	6	-	
10	<i>Thlaspi alpestre</i>	1	5	2	1	3	
10	<i>Hieracium anglicum</i>	-	6	1	3	2	<i>murorum</i>
10	<i>Primula farinosa</i>	-	6	2	1	3	1303
10	<i>Crepis succisæfolia</i>	-	6	-	4	2	
9	<i>Potentilla alpestris</i>	-	6	2	2	2	<i>verna</i>
9	<i>Cerastium alpinum</i>	1	5	2	4	-	1125, 1392
9	<i>Lychnis Viscaria</i>	2	4	2	4	-	
9	<i>Hieracium gothicum</i>	1	5	1	2	3	<i>murorum</i>
9	<i>Carex elongata</i> 1115	3	3	2	-	4	
9	<i>Trifolium maritimum</i>	6	-	3	-	3	
9	<i>Veronica spicata</i>	5	1	4	-	2	
9	<i>Corallorhiza innata</i>	-	6	-	6	-	
8	<i>Carex Persoonii</i>	1	5	1	3	2	<i>curta</i>
8	<i>Lithosp. purpureo-cærulea</i>	6	-	4	-	2	
8	<i>Sagina ciliata</i> 1121	3	3	1	-	5	<i>procumbens</i>
8	<i>Polygonum mite</i>	4	2	1	-	5	<i>minus</i>
8	<i>Crepis biennis</i> 1123	3	3	-	-	6	
8	<i>Erodium moschatum</i>	6	-	6	-	-	
8	<i>Cerastium latifolium</i>	1	5	1	5	-	<i>alpinum</i>
7	<i>Hieracium iricum</i>	-	6	-	4	2	<i>murorum</i>
7	<i>Sisymbrium Irio</i> 1127	5	1	1	1	4	
7	<i>Dentaria bulbifera</i>	5	1	1	1	4	
7	<i>Salicornia radicans</i>	5	1	1	-	5	<i>herbacea</i>



Co.	6 Sps. cont.	S.	N	W.	Sc.	E.	Bentham.
7	<i>Scilla autumnalis</i>	6	-	3	-	3	
7	<i>Cyperus longus</i> 1131	6	-	4	-	2	
6	<i>Epipactis ovalis</i>	3	3	3	1	2	latifolia
6	<i>Campanula rapunculoides</i>	2	4	1	2	3	
6	<i>Draba muralis</i> 1134	4	2	4	-	2	
6	<i>Woodsia ilvensis</i> , etc.	1	5	2	3	1	
6	<i>Teucrium Scordium</i>	5	1	1	-	5	
6	<i>Scheuchzeria palustris</i>	1	5	2	1	3	
6	<i>Vicia gracilis</i> 1138	6	-	2	-	4	tetrasperma
6	<i>Polygonum dumetorum</i>	6	-	2	-	4	
6	<i>Callitriche autumnalis</i>	1	5	1	4	1	verna (aq.)
6	<i>Aira alpina</i> 1141	-	6	-	6	-	cæspitosa
6	<i>Oxytropis uralensis</i>	-	6	-	6	-	
6	<i>Asperugo procumbens</i>	1	5	1	4	1	
6	<i>Aconitum Napellus</i>	6	-	6	-	-	
6	<i>Cherleria sedoides</i> 1145	-	6	-	6	-	
5 Subprovinces.							
10	<i>Saxifraga nivalis</i>	1	4	2	3	-	
10	<i>Trifolium ochroleucum</i>	5	-	1	-	4	
10	<i>Ajuga Chamæpitys</i>	5	-	1	-	4	
9	<i>Sesleria cærulea</i> 1149	-	5	1	2	2	
9	<i>Hieracium crocatum</i>	-	5	-	3	2	prenanthoides
9	<i>Fumaria</i> "parviflora"	4	1	-	1	4	officinalis
9	<i>Goodyera repens</i> 1152	-	5	-	5	-	
9	<i>Melampyrum cristatum</i>	5	-	-	-	5	
8	<i>Ornithogalum pyrenaicum</i>	5	-	3	-	2	
7	<i>Poa cæsia</i> , etc.	1	5	1	3	2	nemoralis
7	<i>Alisma natans</i> 1156	3	2	3	1	1	
7	<i>Orobanche rubra</i>	1	4	1	3	1	
7	<i>Pseudathyrium alpestre</i>	-	5	-	5	-	
7	<i>Fumaria Vaillantii</i>	5	-	-	-	5	officinalis
7	<i>Ophrys aranifera</i>	5	-	?	-	5	
7	<i>Sibthorpia europæa</i>	5	-	4	-	1	
7	<i>Juncus balticus</i> 1162	-	5	-	5	-	
7	<i>Atriplex pedunculata</i>	5	-	-	-	5	
7	<i>Mathiola sinuata</i>	5	-	5	-	-	
7	<i>Cicendia filiformis</i>	5	-	3	-	2	
?	<i>Festuca arundinacea</i> ?	3	2	2	1	2	elatio
6	<i>Asplenium germanicum</i>	1	4	2	2	1	

Co.	5 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
6	<i>Asarum europæum</i>	2	3	3	-	2	
6	<i>Lythrum hyssopifolium</i>	4	1	1	-	4	
6	<i>Hieracium chrysanthum</i>	-	5	1	4	-	murorum
6	<i>Chenopodium glaucum</i>	3	2	-	-	5	
6	<i>Lactuca saligna</i> 1172	5	-	1	-	4	
6	<i>Polypogon monspeliensis</i>	5	-	1	-	4	
6	<i>Zostera nana</i> 1174	3	2	1	1	3	
6	<i>Rubus hirtus</i> 1175	4	1	2	1	2	fruticosus
6	<i>Hieracium holosericeum</i>	-	5	1	4	0	alpinum
6	<i>Carex vaginata</i>	-	5	-	5	-	panicea
6	<i>Poa bulbosa</i> 1178	5	-	1	-	4	
6	<i>Polygala calcarea</i>	5	-	2	-	3	vulgaris
6	<i>Ajuga pyramidalis</i>	-	5	-	5	-	
6	<i>Pyrola uniflora</i>	-	5	-	5	-	
5	<i>Rubus Salteri</i> 1182	3	2	2	-	3	fruticosus
5	<i>Rubus incurvatus</i>	4	1	4	-	1	fruticosus
5	<i>Barbarea arcuata</i>	4	1	2	-	3	vulgaris
5	<i>Polemonium cæruleum</i>	1	4	2	-	3	
5	<i>Rubus mucronatus</i>	2	3	2	1	2	fruticosus
5	<i>Hippophae rhamnoides</i>	4	1	-	-	5	
5	<i>Silene conica</i> 1188	3	2	-	2	3	
5	<i>Hypochæris maculata</i>	4	1	2	-	3	
5	<i>Eryngium campestre</i>	4	1	3	-	2	
5	<i>Lactuca Scariola</i>	5	-	1	-	4	820
5	<i>Herniaria glabra</i> , etc.	5	-	1	-	4	
5	<i>Polypogon littoralis</i>	5	-	1	-	4	
4 Subprovinces.							
8	<i>Iberis amara</i> 1194	4	-	-	-	4	
7	<i>Helianthemum canum</i>	2	2	3	-	1	
7	<i>Schoberia fruticosa</i>	4	-	1	-	3	
7	<i>Cynoglossum sylvaticum</i>	4	-	1	-	3	
7	<i>Phyteuma orbiculare</i>	4	-	1	-	3	
6	<i>Impatiens Noli</i>	2	2	4	-	-	
6	<i>Mespilus germanica</i>	4	-	2	-	2	
6	<i>Hieracium prenanthoides</i>	-	4	-	2	2	..... ?
6	<i>Setaria viridis</i> 1202	4	-	-	-	4	
6	<i>Leucojum æstivum</i>	4	-	1	-	3	
6	<i>Briza minor</i> 1204	4	-	3	-	1	
6	<i>Galium auglicum</i>	4	-	-	-	4	

Co.	4 Sps. cont.	S.	N.	W.	Sc.	E.	Benth.
6	<i>Tillæa muscosa</i>	4	-	1	-	3	
6	<i>Crocus nudiflorus</i>	2	2	3	-	1	
5	<i>Rubus scaber</i> 1208	3	1	2	-	2	fruticosus
5	<i>Orobanche cærulea</i>	4	-	1	-	3	
5	<i>Bartsia alpina</i>	-	4	1	1	2	
5	<i>Rubus Guntheri</i>	4	-	3	-	1	fruticosus
5	<i>Borkhausia taraxacifolia</i>	4	-	1	-	3	
5	<i>Carex atrata</i> 1213	1	3	1	3	-	
5	<i>Sedum Forsterianum</i>	4	-	4	-	-	rupestre
5	<i>Adiantum Capillus</i>	3	1	4	-	-	
5	<i>Sedum album</i> 1216	4	-	4	-	-	
5	<i>Glyceria Borreri</i>	4	-	-	-	4	distans
5	<i>Medicago minima</i>	4	-	-	-	4	
5	<i>Sagina saxatilis</i>	-	4	-	4	-	736
5	<i>Veronica alpina</i>	-	4	-	4	-	
5	<i>Nuphar pumila</i>	-	4	-	4	-	lutea
5	<i>Lotus angustissimus</i>	4	-	2	-	2	1262
5	<i>Sonchus palustris</i>	4	-	-	-	4	
4	<i>Salix laurina</i> 1224	-	4	1	3	-	phylicifolia
4	<i>Genista pilosa</i>	4	-	2	-	2	
4	<i>Elyna caricina</i>	-	4	1	1	2	
4 ?	<i>Phleum asperum</i>	4	-	1	-	3	
4	<i>Rubus pyramidalis</i>	4	-	4	-	-	fruticosus
4	<i>Hieracium cæsium</i>	-	4	-	2	2	murorum
4	<i>Salix arbuscula</i>	-	4	-	4	-	repens
4	<i>Viola Curtisii</i> 1231	4	-	4	-	-	tricolor
4	<i>Rhynchospora fusca</i>	4	-	3	-	1	
4	<i>Aira canescens</i>	4	-	1	-	3	
4	<i>Digitaria humifusa</i>	4	-	-	-	4	
4	<i>Carex humilis</i> 1235	4	-	4	-	-	
4	<i>Dianthus prolifer</i>	4	-	-	-	4	
4	<i>Salix Myrsinites</i>	-	4	-	4	-	1238
4	<i>Salix procumbens</i>	-	4	-	4	-	Myrsinites
4	<i>Orobis niger</i> 1239	-	4	-	3	1	
4	<i>Alopecurus alpinus</i>	-	4	-	4	-	
4	<i>Stellaria cerastoides</i>	-	4	-	4	-	
4	<i>Draba rupestris</i> 1242	-	4	-	4	-	
4	<i>Phleum Boehmeri</i>	4	-	-	-	4	

Co.	3 Subprovinces.	S.	N.	W.	Sc.	E.	Bentham.
6	<i>Barkhausia foetida</i>	3	-	-	-	3	
6	<i>Veronica triphyllos</i>	2	1	-	-	3	
5	<i>Barbarea stricta</i>	1	2	1	-	2	vulgaris
5	<i>Delphinium Ajacis</i> ?	3	-	-	-	3	
4	<i>Lastrea cristata</i> 1248	1	2	1	-	2	
4	<i>Viola stagnina</i>	3	-	1	-	2	sylvatica
4	<i>Ranunculus tripartitus</i>	3	-	2	-	1	aquatilis
4	<i>Epilobium lanceolatum</i>	3	-	2	-	1	roseum
4	<i>Allium Schoenoprasum</i>	1	2	2	-	1	
4	<i>Hieracium lingulatum</i>	-	3	-	3	-	murorum
4	<i>Hieracium nigrescens</i>	-	3	-	3	-	murorum
4	<i>Scleranthus perennis</i>	3	-	1	-	2	
4	<i>Carex montana</i> 1256	3	-	2	-	1	
4	<i>Carex rupestris</i>	-	3	-	3	-	
4	<i>Juncus biglumis</i>	-	3	-	3	-	961
4	<i>Juncus castaneus</i>	-	3	-	3	-	
4	<i>Salix reticulata</i>	-	3	-	3	-	
4	<i>Veronica saxatilis</i>	-	3	-	3	-	
4	<i>Lotus hispidus</i> 1262	3	-	3	-	-	angustissimus
4	<i>Buxus sempervirens</i>	3	-	-	-	3	
4	<i>Medicago falcata</i>	3	-	-	-	3	1291
4	<i>Liparis Loeselii</i>	3	-	-	-	3	
3	<i>Rubus latifolius</i>	-	3	-	2	1	fruticosus
3	<i>Carum Carui</i> 1267	1	2	1	-	2	
3	<i>Potamogeton acutifolius</i>	3	-	-	-	3	pusillus
3	<i>Orobanche picridis</i>	3	-	1	-	2	minor
3	<i>Diotis maritima</i>	3	-	2	-	1	
3	<i>Elatine Hydropiper</i>	3	-	2	-	1	
3	<i>Gentiana verna</i>	-	3	1	-	2	
3	<i>Potentilla fruticosa</i>	-	3	1	-	2	
3	<i>Lastrea rigida</i> 1274	-	3	2	-	1	
3	<i>Myosotis alpestris</i>	-	3	1	1	1	sylvatica
3	<i>Seseli Libanotis</i>	3	-	-	-	3	
?	<i>Cephalanthera rubra</i>	3	-	2	-	1	
3	<i>Viola lactea</i> 1278	3	-	1	-	2	sylvatica
3	<i>Cyperus fuscus</i>	2	1	-	-	3	
3	<i>Leersia oryzoides</i>	3	-	-	-	3	
3	<i>Scirpus triqueter</i>	3	-	-	-	3	
3	<i>Trinia vulgaris</i>	3	-	3	-	-	



Cu.	3 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
3	<i>Polycarpon tetraphyllum</i>	3	-	3	-	-	
3	<i>Saxifraga rivularis</i>	-	3	-	3	-	
3	<i>Actæa spicata</i> 1285	-	3	1	-	2	
3	<i>Chrysocoma Linosyris</i>	3	-	3	-	-	
3	<i>Stachys germanica</i>	3	-	-	-	3	
3	<i>Cypripedium Calceolus</i>	-	3	-	-	3	
3	<i>Senecio paludosus</i>	3	-	-	-	3	
3	<i>Phleum alpinum</i>	-	3	-	3	-	
3	<i>Medicago sylvestris</i>	3	-	?	-	3	falcata
3	<i>Verbascum virgatum</i>	3	-	3	-	-	
3	<i>Silene Otites</i> 1293	3	-	-	-	3	
3	<i>Cineraria palustris</i>	3	-	-	-	3	
2 Subprovinces.							
4	<i>Hieracium lasiophyllum</i>	1	1	1	1	-	murorum
4	<i>Melampyrum arvense</i>	2	-	-	-	2	
4	<i>Scirpus carinatus</i>	2	-	-	-	2	lacustris
4	<i>Verbascum floccosum</i>	2	-	-	-	2	
4	<i>Orchis militaris</i>	2	-	-	-	2	1311, 1367
3	<i>Euphorbia stricta</i> 1300	2	-	1	-	1	platyphyllos
3	<i>Carum Bulbocastanum</i>	2	-	-	-	2	
3	<i>Hieracium eximium</i>	-	2	-	2	-	alpinum
3	<i>Primula scotica</i>	-	2	-	2	-	farinosa
3	<i>Erica ciliaris</i> 1304	2	-	2	-	-	
3	<i>Hieracium senescens</i>	-	2	-	2	-	murorum
3	<i>Statice caspia</i> 1306	2	-	-	-	2	
3	<i>Muscari racemosum</i>	2	-	-	-	2	
3	<i>Tordylium maximum</i>	2	-	-	-	2	
3	<i>Filago gallica</i> 1309	2	-	-	-	2	
3	<i>Illecebrum verticillatum</i>	2	-	2	-	-	
3	<i>Orchis tephrosanthos</i>	2	-	-	-	2	militaris
2	<i>Rubus Bloxamii</i>	1	1	1	-	1	fruticosus
2	<i>Hieracium denticulatum</i>	-	2	-	2	-	boreale
2	<i>Hieracium corymbosum</i>	-	2	-	1	1	murorum
2	<i>Primula elatior</i> 1315	2	-	-	-	2	veris
2	<i>Convallaria verticillata</i>	-	2	-	1	1	
2	<i>Juncus filiformis</i>	-	2	1	1	-	
2	<i>Eriophorum gracile</i>	1	1	-	-	2	angustifolium
2	<i>Pinguicula alpina</i>	-	2	-	2	-	
2	<i>Poa minor</i> 1320	-	2	-	2	-	laxa

Co.	2 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
2	<i>Poa laxa</i> 1321	-	2	-	2	-	1320
2	<i>Luzula arcuata</i>	-	2	-	2	-	
2	<i>Arenaria rubella</i>	-	2	-	2	-	verna
2	<i>Lychnis alpina</i>	-	2	1	1	-	
2	<i>Cynodon Dactylon</i>	2	-	2	-	-	
2	<i>Thlaspi perfoliatum</i>	2	-	1	-	1	
2	<i>Arabis stricta</i> 1327	2	-	2	-	-	
2	<i>Trifolium strictum</i>	2	-	2	-	-	
2	<i>Spiranthes æstivalis</i>	2	-	1	-	1	
2	<i>Orchis hircina</i> 1330	2	-	-	-	2	
2	<i>Carex punctata</i> ?	2	-	2	-	-	
2	<i>Apera interrupta</i>	2	-	-	-	2	Spica-venti
2	<i>Salvia pratensis</i>	2	-	-	-	2	
2	<i>Chenopodium botryoides</i>	2	-	-	-	2	rubrum
2	<i>Artemisia campestris</i>	2	-	-	-	2	
2	<i>Veronica verna</i> 1336	2	-	-	-	2	
2	<i>Holosteum umbellatum</i>	2	-	-	-	2	
2	<i>Carex paradoxa</i>	-	2	-	-	2	paniculata
2	<i>Scrophularia Scorodonia</i>	2	-	2	-	-	
2	<i>Physospermum cornubien.</i>	2	-	2	-	-	
2	<i>Peucedanum officinale</i>	2	-	-	-	2	
2	<i>Gentiana nivalis</i>	-	2	-	2	-	
2	<i>Erigeron alpinus</i>	-	2	-	2	-	
2	<i>Cistopteris montana</i>	-	2	-	2	-	
2	<i>Corrigiola littoralis</i>	2	-	2	-	-	
2	<i>Hypericum linariifolium</i>	2	-	2	-	-	
2	<i>Helianthemum polifolium</i>	2	-	2	-	-	
2	<i>Isnardia palustris</i>	2	-	-	-	2	
1 Subprovince.							
2	<i>Rubus imbricatus</i> 1349	1	-	1	-	-	fruticosus
2	<i>Rubus pampinosus</i>	1	-	1	-	-	fruticosus
2	<i>Caltha radicans</i> 1351	-	1	-	1	-	palustris
2	<i>Equisetum Mackaii</i>	-	1	-	1	-	
2	<i>Eriocaulon septangulare</i>	-	1	-	1	-	
2	<i>Carex rariflora</i> 1354	-	1	-	1	-	limosa
2	<i>Carex aquatilis</i>	-	1	-	1	-	vulgaris
2	<i>Salix lanata</i> 1356	-	1	-	1	-	
2	<i>Guaphalium norvegicum</i>	-	1	-	1	-	sylvaticum
2	<i>Hieracium flocculosum</i>	-	1	-	1	-	murorum

Co.	1 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
2	<i>Hieracium calenduliflorum</i>	-	1	-	1	-	alpinum ?
2	<i>Hieracium gracilentum</i>	-	1	-	1	-	murorum
2	<i>Hieracium alpinum</i> (B.)	-	1	-	1	-	
2	<i>Mulgedium alpinum</i>	-	1	-	1	-	
2	<i>Astragalus alpinus</i>	-	1	-	1	-	
2	<i>Carex VahlII</i> 1364	-	1	-	1	-	
2	<i>Pulmonaria angustifolia</i>	1	-	-	-	1	
2	<i>Carex depauperata</i>	1	-	-	-	1	distans
2	<i>Orchis fusca</i> 1367	1	-	-	-	1	militaris
2	<i>Ophrys arachnites</i>	1	-	-	-	1	apifera
?	<i>Erythræa latifolia</i> (Sm.)	?	1	1	-	-	Centaureum
?	<i>Saxifraga cæspitosa</i>	-	1	-	1	-	
1	<i>Rubus fissus</i> 1371	1	-	1	-	-	fruticosus
	<i>Hierochloe borealis</i>	-	1	-	1	-	
	<i>Arundo stricta</i> 1373	-	1	1	-	-	
	<i>Knappia agrostidea</i>	1	-	1	-	-	
	<i>Erica vagans</i> 1375	1	-	1	-	-	
	<i>Lobelia urens</i> 1376	1	-	1	-	-	
	<i>Arabis ciliata</i> , var.	1	-	1	-	-	
	<i>Rubus Grabowskii</i>	-	1	-	-	1	fruticosus
	<i>Rubus Balfourianus</i>	1	-	1	-	-	fruticosus
	<i>Galium Vaillantii</i>	1	-	-	-	1	Aparine
	<i>Galium montanum</i>	-	1	-	-	1	saxatile
	<i>Hieracium nitidum</i>	-	1	-	1	-	murorum
	<i>Hieracium aggregatum</i>	-	1	-	1	-	murorum
	<i>Hieracium globosum</i>	-	1	-	1	-	alpinum
	<i>Potamogeton "gracilis?"</i>	-	1	-	-	1	pusillus ?
	<i>Potamogeton "trichoides"</i>	1	-	-	-	1	pusillus
	<i>Orobanche amethystea</i> ?	1	-	1	-	-	minor
	<i>Polygala austriaca</i>	-	1	-	-	1	vulgaris
	<i>Arenaria uliginosa</i>	-	1	-	-	1	
	<i>Carex "lagopina"</i> 1390	-	1	-	1	-	
	<i>Saxifraga cernua</i>	-	1	-	1	-	
	<i>Cerastium nigrescens</i>	-	1	-	1	-	alpinum
	<i>Arenaria norvegica</i>	-	1	-	1	-	
	<i>Oxytropis campestris</i>	-	1	-	1	-	
	<i>Menziesia cærulea</i>	-	1	-	1	-	
	<i>Salix acutifolia</i> 1396	-	1	-	-	1	
	<i>Calamintha sylvatica</i>	1	-	-	-	1	officinalis

Co.	1 Sps. cont.	S.	N.	W.	Sc.	E.	Bentham.
1	<i>Carex tomentosa</i> 1398	1	-	1	-	-	
	<i>Spartina alterniflora</i>	1	-	-	-	1	stricta
	<i>Euphorbia pilosa</i>	1	-	1	-	-	
	<i>Euphorbia hiberna</i>	1	-	1	-	-	
	<i>Lloydia serotina</i>	1	-	1	-	-	
	<i>Helianthemum Breweri</i>	1	-	1	-	-	
	<i>Cotoneaster vulgaris</i>	1	-	1	-	-	
	<i>Potentilla rupestris</i>	1	-	1	-	-	
	<i>Draba aizoides</i> 1406	1	-	1	-	-	
	<i>Silene italica</i> 1407	1	-	-	-	1	
	<i>Lathyrus hirsutus</i>	1	-	-	-	1	
	<i>Teucrium Botrys</i>	1	-	-	-	1	
	<i>Orobanche caryophyllacea</i>	1	-	-	-	1	
	<i>Phyteuma spicatum</i>	1	-	-	-	1	
	<i>Dianthus cæsius</i> 1412	1	-	1	-	-	
	<i>Allium sphærocephalum</i>	1	-	1	-	-	
	<i>Scirpus Holoschænus</i>	1	-	1	-	-	
	<i>Bupleurum aristatum</i>	1	-	1	-	-	
	<i>Trifolium Bocconi</i>	1	-	1	-	-	
	<i>Trifolium Molinerii</i>	1	-	1	-	-	
	<i>Trichonema Columnæ</i>	1	-	1	-	-	
	<i>Arthrolobium ebracteatum</i>	1	-	1	-	-	
	<i>Simethis bicolor</i> 1420	1	-	1	-	-	
	<i>Gladiolus imbricatus</i> ?	1	-	-	-	1	
	<i>Polygonum maritimum</i>	1	-	-	-	1	760
	<i>Mathiola incana</i> 1423	1	-	-	-	1	
	<i>Carduus tuberosus</i> 1424	1	-	1	-	-	
	<i>Epipogium aphyllum</i>	1	-	1	-	-	
?	<i>Eriophorum alpinum</i> .	Extinct in Forfar.					Sutherland ?
?	<i>Alchemilla conjuncta</i> .	Very uncertain in Britain.					
?	<i>Arum italicum</i> .	Reported in the Isle of Wight.					

1. *Census by Provinces.*

In 18 provinces, 303 species. In 9 provinces, 43 species.

17	"	102	"	8	"	49	"
16	"	102	"	7	"	48	"
15	"	82	"	6	"	45	"
14	"	58	"	5	"	73	"
13	"	46	"	4	"	60	"



In 12 provinces, 55 species.      In 3 provinces, 78 species.

11	"	46	"	2	"	74	"
10	"	50	"	1	"	111	"

### 2. Census by Sub-provinces.

In 38 subprovinces, 120 species.      In 19 subprovinces, 29 species.

37	"	54	"	18	"	24	"
36	"	44	"	17	"	27	"
35	"	41	"	16	"	20	"
34	"	46	"	15	"	21	"
33	"	39	"	14	"	19	"
32	"	36	"	13	"	22	"
31	"	51	"	12	"	31	"
30	"	40	"	11	"	23	"
29	"	38	"	10	"	21	"
28	"	37	"	9	"	34	"
27	"	32	"	8	"	34	"
26	"	28	"	7	"	30	"
25	"	26	"	6	"	49	"
24	"	28	"	5	"	48	"
23	"	27	"	4	"	50	"
22	"	31	"	3	"	51	"
21	"	26	"	2	"	54	"
20	"	17	"	1	"	77	"

### 3. Census by Counties.

In 99 counties, 2 species.      In 49 counties, 17 species.

98	"	1	"	48	"	6	"
97	"	3	"	47	"	12	"
96	"	2	"	46	"	11	"
95	"	15	"	45	"	9	"
94	"	10	"	44	"	15	"
93	"	8	"	43	"	11	"
92	"	11	"	42	"	6	"
91	"	14	"	41	"	12	"
90	"	18	"	40	"	14	"
89	"	13	"	39	"	6	"
88	"	18	"	38	"	5	"
87	"	13	"	37	"	10	"

In 86 counties, 11 species.    In 36 counties, 6 species.

85	"	16	"	35	"	20	"
84	"	15	"	34	"	10	"
83	"	9	"	33	"	9	"
82	"	16	"	32	"	14	"
81	"	8	"	31	"	7	"
80	"	21	"	30	"	23	"
79	"	14	"	29	"	9	"
78	"	11	"	28	"	9	"
77	"	16	"	27	"	9	"
76	"	15	"	26	"	9	"
75	"	12	"	25	"	21	"
74	"	10	"	24	"	7	"
73	"	6	"	23	"	7	"
72	"	10	"	22	"	12	"
71	"	14	"	21	"	9	"
70	"	13	"	20	"	23	"
69	"	11	"	19	"	9	"
68	"	12	"	18	"	12	"
67	"	17	"	17	"	17	"
66	"	6	"	16	"	18	"
65	"	14	"	15	"	21	"
64	"	8	"	14	"	10	"
63	"	8	"	13	"	15	"
62	"	17	"	12	"	15	"
61	"	11	"	11	"	22	"
60	"	16	"	10	"	20	"
59	"	6	"	9	"	32	"
58	"	12	"	8	"	16	"
57	"	9	"	7	"	24	"
56	"	14	"	6	"	41	"
55	"	9	"	5	"	30	"
54	"	18	"	4	"	43	"
53	"	17	"	3	"	41	"
52	"	11	"	2	"	57	"
51	"	8	"	1	"	57	"
50	"	17	"	?	"	3	"

#### 4. *Explanations of the Census.*

The preceding 'Census of Species' may be regarded and explained under three aspects. First, the numbers which precede the names of the plants may be said to constitute the general census for total Britain. Secondly, the numbers which succeed the names, in the columns headed by the initial letters S N W Sc E, give a more local or partial census, presently to be explained. Thirdly, repetitions of some of the specific names at the end of several of the lines. Further, three summaries are added at the end of the general list of plants, showing the numbers of the species in relation to the numbers of the provinces and other subdivisions.

*First.*—The names of the plants are repetitions of those before enumerated in the 'Summary of Distribution.' They succeed each other in accordance with the relative frequency of the plants, one compared with another, as closely as that condition or character can be exhibited by aid of the test resorted to. The plants are first divided into 38 groups, in accordance with the number of the subprovinces in which they have been ascertained to occur, or are found reported on reliable authority. The plants in each of the 38 groups are next arranged in a series according to the number of counties and vicecounties, as indicated by the number prefixed to each. And in cases where the number of subprovinces and counties is the same for two or more species, then the number of primary provinces is taken to determine the position of the names in the series; but it has not been deemed requisite to introduce a second column of prefixed nos. for the sole purpose of showing the number of those provinces. Further, in cases where the number of primary provinces is also equal for two or more plants, then various other circumstances have been resorted to, as tests or measures of relative frequency; for instance, the altitudes attained and the greater or less probability of other habitats being discovered, &c. &c. The series thus worked out is numbered from 1 to 1425 by means of numbers set after the shorter names only, for typographical convenience; the proper nos. for the intermediately placed names being easily known by reckoning from those which are so inserted.

It is made obvious by the prefixed nos., that the plants would have been somewhat differently grouped together, if the number of counties and vicecounties had been taken as the leading test, by first dividing the whole flora into 99 groups (the largest number of counties ascertained

for any of the species), and then arranging the names under each group in accordance with the number of subprovinces. Still a different set of groups or series of names would have resulted, if the 18 primary provinces had been resorted to as the leading test, followed in succession by the secondary or subprovinces, and then by the counties and vice-counties. After actually drawing out lists in the three different methods, that in which the subprovinces was made the leading test was adopted, because apparently giving the most correct sequence of the names. The comital and vicecomital floras are yet incompletely ascertained; and it was found that the use of these more numerous divisions tended too much to place plants high in the census on account of partial frequency. On the contrary, the provincial floras are most of them nearly complete; and so far they are best adapted to give a correct census. But 18 such lists are not sufficiently numerous; plants very thinly scattered over Britain, if they chance to be found in all the 18 provinces, being placed above other more frequent plants which are absent or simply unascertained in one or two of the provinces.

Whatever may be the particular mode of applying it, the adopted test involves a combination of the extent of area along with frequency of repetition. By adopting the more numerous comital divisions, a greater importance is given to the latter condition, that of frequent repetition. The larger, and therefore fewer, divisions assign a predominant value to extent of area. On the whole, the 38 subprovinces afford a better test than the 18 provinces or the 112 counties and vicecounties; a copious list of species having been made out for each of them, and their floras being nearly complete for thirty of them. False positions of the species in the census list may be attributed much more usually to the imperfect state of botanical knowledge, than to any inadequacy of the adopted test towards meeting the object in view. A census list so made out is really a summary of the records left by several generations of British botanists, augmented by manuscript contributions from fully one half of the most competent local botanists of the present age. Comparatively with a census so obtained, the personal experience of any individual botanist, or any score of individual botanists, sinks into insignificance, as being unavoidably imperfect and partial, too local and unequal.

But in using the general list as a test or measure of rarity and frequency, it is to be recollected that botanists do not record all plants equally and impartially. Old records are often found to be unavailable in tracing the area and frequency of modern segregate species, as has



been before remarked. Such segregates are now less familiar to many botanists; so that often their localities remain unrecorded, or are perhaps recorded erroneously for some other allied species. Many botanists give little attention to grasses, sedges, willows, brambles, roses, and other plants not easy to discriminate; the consequences being similar, in the species being less recorded or mis-recorded, in comparison with other plants of greater interest to collectors, or more satisfactorily distinct and distinguishable. So, likewise, various inconspicuous species are probably often overlooked, and thus supposed to be more rare than is the fact; nobody would overlook the *Clematis* or *Bryonia*, if actually looking out for plants; though many might pass the *Limosella* or *Littorella* unobserved. These and various other circumstances will always interfere with our attempts either to place plants in a consecutive series, or to combine them into groups, in accordance with their true rarity or frequency.

It might seem needless to add further, that a census list for Britain in general cannot be applicable to any one separate county or other section of the whole island. Nor could lists for a few isolated spots make more than a highly imperfect approach towards a true census for entire Britain. And yet the blundering stupidity of some writers, who attempt phyto-geographical statistics, and who even pretend to prescribe rules and methods for ascertaining the relative frequency of plants, shows too plainly that the local conditions may be confused with the general,—that half-a-dozen or half-a-score records of parochial abundance or scarcity may be misconstrued into an adequate geographical census of species.

*Second.*—In regard to the columns of figures which follow the names of the plants under distinctive initial letters. These figures indicate the number of subprovinces for large sections or divisions of Britain; and are intended to give some idea respecting the part of Britain in which each species is more or less fully distributed. The first double column, with the head letters S and N, shows the number of subprovinces for South Britain, as distinguished from Middle and North Britain; the two latter being taken together. As explained on page 135, the former includes 18 subprovinces, and the two latter divisions include 20. In order to render the numerical contrast more exact, the subprovince of East Trent, corresponding with the county of Lincoln, is heré reckoned along with South Britain, instead of Mid Britain. The two letters will be explained thus:—

S. South Britain includes subprovinces 1 to 19.

N. North (and Mid) Britain „ 20 to 38.

The second or treble column, with the head letters W Sc E, shows the number of subprovinces for Scotland in contrast against England, and the western and eastern sides of England also in contrast against each other. It was of course impossible to divide the 25 English subprovinces into two groups exactly equal with the 13 Scottish subprovinces; and the western division has accordingly only 12 instead of 13. The chief purpose of this second column of figures, is to form such a comparison or contrast as will bring into view any peculiar tendency of particular species to the western or to the eastern side of the island. For this purpose it was found that the two sides of England, apart from Scotland, were more suitable than the two sides of total Britain; their division being imperfect and unsatisfactory in North Britain, and the distinction between eastern and western species being there confused by the intermingling of alpine or arctic plants with them. And by placing the nos. for the Scottish subprovinces between the two series for England, a second comparison of South with North is also obtained, less unequal than the former in respect to latitude. The line of separation between the western and eastern divisions was explained on pages 136—7 of the present volume. On comparing eastern and western England together, or these two with Scotland, it will be very evident that difference of latitude is far more potential than difference of longitude, in altering the distribution of plants. The floras of western and eastern England are more closely similar than those of England and Scotland; and there is correspondingly a less diversity in the sub-provincial census of the species, that is, less between west and east in England, than between either of these and Scotland.

But slight differences in the stated number of subprovinces may be disregarded, especially in the ternary division where the totals are only 12 and 13. The lists of species for several of the subprovinces being incomplete, their numbers may be rendered unequal for some of the species simply through deficiency of knowledge. Thus, *Juncus effusus* is represented as wanting in one of the northern and Scottish subprovinces, on account of the name not appearing in Balfour and Babin-ton's list of species observed in the Hebrides. The presumption, however, is very strong in this instance, that the name of *Juncus conglomeratus* was incorrectly substituted in their list, or that it really included both the species. See volume third, page 39 of this work, for the

grounds of such a supposition. *Tussilago Farfara* is very probably in the same condition ; being also placed in the group of species found in 37 (not 38) subprovinces, and given as absent from one of the northern and Scottish subprovinces, on the like ground of its omission from the Hebridean list, or being there misnamed, *Pelasites*, as suggested in volume second, pages 108 and 109. Many other such examples might be cited, where inequalities are induced or increased by incomplete knowledge of localities ; while in other examples, probably, inexact knowledge may operate in the contrary manner, by rendering the differences apparently less than a complete acquaintance with the facts would show them to be.

*Third.*—Some of the lines terminate with specific names, or with nos. which correspond with the names of other plants, constituting together a column of names and nos. very partially filled in. They relate to Bentham's 'Handbook of the British Flora,'—a new work which has only come to hand since the 'Summary of Distribution' was in the press. This 'Handbook' is remarkable for carrying the aggregation of species to an extreme, which is widely at variance with the practice of segregation, so current of late years among the botanists of this country. In the 'Summary' the number of plants treated as species is 1424 ; though truly not all of them believed to be such by the present writer. The addition of *Gladiolus communis* or *imbricatus* raises the number to 1425 in the preceding 'Census.' In the fourth edition of the 'Manual of British Botany,' so frequently mentioned in former pages, the same plants appear as 1495 good and true species. On the contrary, in the 'Handbook of the British Flora' the same plants are reduced to 1175 species. Thus, the actual difference between the books of Bentham and Babington, in regard to the disputed point, of which are true species, amounts to 320 species, without reckoning the aliens and those peculiar to Ireland or the Channel Isles.

Now, as a general rule, it may be said that the segregates which are held species by some botanists, only varieties by other botanists, have had their localities less fully and less accurately recorded. Thus, they will usually be placed too low in the census list. Further, it may be remarked again, that the separation of these disputed segregates must more or less vitiate and make doubtful the recorded habitats and localities of the old species from which they are dissevered. Some of these latter may thus be placed too high in the same list. The rather extreme views of Mr. Bentham afford means and opportunity for



making a distinction between the questioned and unquestioned species, quite appropriate to the objects of the census list. All those plants which stand as species in that list, but which are treated as varieties in the 'Handbook,' are distinguished by the names of the species, to which they are referred by Mr. Bentham, being added at the ends of their lines. Conversely, the nos. of the varieties are added to the lines of the species in which they are sunk by Mr. Bentham. It should perhaps be observed, that in some few cases those references of Mr. Bentham have not been adhered to with rigid exactness. For example, *Bromus secalinus*, *commutatus*, and *mollis* of the census list are united under the name of *Bromus arvensis* in the 'Handbook'; *B. secalinus* being there given as the typical form, even though its chief peculiar characters are alleged to arise "from being cultivated with the corn." In this instance, instead of adhering to the 'Handbook' (impossible, as no *B. arvensis* is recognized among the British plants, by the Cybele) *B. mollis* has been referred to after the names of the other two species, *secalinus* and *commutatus*. In other instances Mr. Bentham sinks British alleged species under foreign species, the names of which do not appear in the list, and consequently cannot be referred to. Such is the case with *Euphorbia portlandica*, sunk under the continental *E. segetalis*, but necessarily therefore allowed to stand as an unquestioned species in the census list.

'Bentham's Handbook' and 'Babington's Manual' may be contrasted against each other, and will afford a striking illustration of that "uncertainty of species" before commented upon in pages 35 to 43. It seems impossible to doubt that book-species are to a great extent (if not wholly) conventional and optional, when we thus find two competent botanists differing by one-fourth or one-fifth (320 in 1175 or 1495) of the flora of a small country so much investigated as that of Britain. The references to Mr. Bentham's views have been substituted in the census list in the place of somewhat similar intimations discarded for them. It was first intended to add one or other of these four terms to each of the species,—

aggregate. segregate. dimidiate. integrate.

As before explained, the term 'aggregate' is used for a species which is believed by various botanists to include several real species, like the *Ranunculus aquatilis* or *Rubus fruticosus* of Linneus. The term 'segregate' is also used in former pages, to express a species or variety severed from an aggregate, and regarded in the one way by some



botanists, in the other way by other botanists; like the *Ranunculus confusus* or *Rubus discolor*, separated from the two Linnean species above named. In many instances, one or more segregates are taken from an old species, the remnant being still accounted a species, and retaining its old name. The term 'dimidiate' would have been used to express a species so halved or curtailed; and thus *Veronica agrestis* would be deemed a dimidiate species, after separation from it of the segregate *V. polita*; it being held an aggregate species where understood to consist of both the modern species under the old name. The fourth term 'integrate' is left applicable to species which botanists allow to remain as first established, without severance of sub-species from them; examples being afforded by *Adoxa moschatellina* and *Atropa Belladonna*;—though it is somewhat unsafe now to assert of any species, that nobody has attempted to split off segregates from it.

In concluding these explanations of the 'Census of Species,' the author may remark that it has required a sacrifice of time and patience, to bring it up to its present and yet imperfect condition, which he could scarcely fore-reckon when commencing to form it. Tens of thousands of records and manuscript notes required to be consulted and collated; and while going through that labour, the elimination of the errors and probable errors, from the reliable facts, was a great additional source of trouble and inconvenience. It seems to be impossible for him to have avoided errors and oversights himself, in the course of this examination; and he may doubtless in some instances have rejected the true, and admitted the false. Still, whether viewed as 38 groups, or as a series of 1425 individual species, the census list may be considered a fair approximation to correctness, although the actual position of many names in it might be somewhat changed on complete knowledge,—placed higher or lower in the series,—in a higher or lower group, as the case might be.

In regard to the three summaries placed at the end of the list. On looking to the first of these, which reckons the number of species in accordance with the provincial census, there appears an accumulation at each end of the series; as if there were some decided tendency of the species to be very local or very general. This apparent tendency is partly fallacious. It is geographically possible that one species, having only 18 localities, might still occur in as many different provinces; while another species, with 1800 or 18000 localities, would equally be found in 18 provinces only. And at the other end of the series, one

species with a single locality, and another species with a score of localities, might alike be limited to single provinces. Actually, such extreme instances do not occur; but there is sufficient approximation thereto to cause an accumulation of species, of very unequal frequency or rarity, at and towards the two extremes of 18 provinces and 1 province. This accumulation is accordingly much reduced under the sub-provincial census, in which the spaces are smaller and more numerous. Still more so in the comital and vice-comital census; partly, through the increased number of the spaces, partly through incomplete knowledge. In that third summary the even nos. are rendered too prominent in species, through entering under 80, 60, 40, 20, &c. some species which are known in so many counties or *thereabouts*; the precise numbers being made doubtful through uncertainties of the records or of the real nativity of the plants in one or more of the counties.

On looking back over the census list in its printed state, a typographical defect becomes unpleasantly obvious. The primary test of frequency is found in the subprovincial grouping of the species; which is thus made the leading intellectual idea of the list; and it ought accordingly to have been presented to the eye of the reader at least as conspicuously as the other nos. and names in secondary detail. Instead, the head-titles of those groups have been rendered insignificant by the use of a minute type for the "38 subprovinces," "37 subprovinces," "36 subprovinces," &c. As printers cannot of course be expected to understand thoroughly all the various subjects which they are called upon to convert into a printed form, it is difficult to prevent the mechanical ideas of the office thus occasionally misdirecting the intellectual ideas of readers, through mis-portraying those of writers.

## VII. AREAS OF SPECIES.

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### I. AUSTRAL SPECIES, ATTENUATING NORTHWARD.

#### 1. *Southward of 51 latitude. Temp. 50 fahr. 10 cent.*

Arthrolobium, 49-50 lat.	1	Scilly Isles only.
Trifolium Bocconi	1	West Cornwall.
Trifolium Molinieri	1	do.
Erica vagans	1	do.
Orobanche amethystea	1	East Cornwall.
Illecebrum verticillatum	1	Cornwall. Devon.
Corrigiola littoralis	1	do. do.
Hypericum linariifolium	1	do. do.
Scrophularia Scorodonia	1	do. do.
Physospermum cornubiense	1	do. do.
Trichonema Columnæ	1	South Devon.
Bupleurum aristatum	1	do.
Lobelia urens	1	do.
Erica ciliaris	1 2	Cornwall. Dorset.
Cynodon Dactylon	1 2	do. do.
Lotus hispidus	1 2	Cornwall. Devon. Dorset.
Polycarpon tetraphyllum	1 2	do. do. do.
Briza minor	1 2	Corn. Dev. Dor. Wight. Hants.
Lotus angustissimus	1 2	Corn. Dev. Hants. Sussex.
Simethis bicolor	- 2	Dorset.
Calamintha sylvatica	- 2	Isle of Wight.
Mathiola incana	- 2	do.
Pulmonaria angustifolia	- 2	Wight. South Hants.
Gladiolus "imbricatus"	- 2	South Hants.
Polygonum maritimum	- 2	do.
Spartina alterniflora	- 2	do.
Isnardia palustris	- 2	Hants. Sussex.

2. Southward of 52 lat. Temp.  $49\frac{1}{2}$  fahr. 9·7 cent.

<i>Verbascum virgatum</i>	1	Cornwall.	Devon.	Somerset.
<i>Helianthemum polifolium</i>	1	South Devon.	North Somerset.	
<i>Scirpus Holoschænus</i> , 51	1	North Devon.		
<i>Euphorbia hiberna</i> , 51	1	do.		
<i>Dianthus cæsius</i> , 51	1	North Somerset.		
<i>Euphorbia pilosa</i> , 51	1	do.		
<i>Viola lactea</i>	1 2	Devon.	Hants.	Sussex.
<i>Carduus tuberosus</i> , 51	- 2	South Wilts.		
<i>Carex tomentosa</i> , 51	- 2	North Wilts.		
<i>Phyteuma spicatum</i>	- 2	Sussex.		
<i>Phyteuma orbiculare</i>	- 2 3	Wilts.	Hants.	Sus. Sur.
<i>Leersia oryzoides</i>	- 2 3	Hants.	Sussex.	Surrey.
<i>Scirpus carinatus</i>	- 2 3	Sussex.	Kent.	Surrey.
<i>Scirpus triquetar</i>	- 2 3	Sussex.	Surrey.	Midx.
<i>Glyceria Borreri</i>	- 2 3	Wight to North Essex.		
<i>Orobanche caryophyllacea</i> , 51	- - 3	East Kent.		
<i>Silene italica</i> , 51	- - 3	West Kent (Mr. Syme).		
<i>Orchis fusca</i> , 51	- - 3	Kent.	Elsewhere?	
<i>Ophrys arachnites</i> , 51	- - 3	Kent.	Surrey.	
<i>Carex depauperata</i> , 51	- - 3	do.	do.	
<i>Teucrium Botrys</i> , 51	- - 3	Surrey.		
<i>Peucedanum officinale</i> , 51	- - 3	East Kent.	South Essex.	
<i>Tordylium maximum</i> , 51	- - 3	Midx.	Oxford.	Bucks.
<i>Salvia pratensis</i> , 51	- - 3	Kent.	Oxford.	
<i>Orchis tephrosanthos</i> , 51	- - 3	Kent.	Berks.	Oxford.
<i>Orchis militaris</i> , 51	- - 3	Herts.	Berks.	Oxf. Bucks.
<i>Filago gallica</i> , 51	- - 3	Kent.	Essex.	Herts.
<i>Lathyrus hirsutus</i> , 51	- - 3	North Essex.		
<i>Buxus sempervirens</i> , 51	- - 3 4	Very uncertain distrib.		
<i>Trinia vulgaris</i>	1 - - - 5	- - i - -		
<i>Epilobium lanceolatum</i>	1 - 3 - 5	- - i o -		
<i>Scilla autumnalis</i>	1 2 3 - 5	- e i o ?		
<i>Polygonum dumetorum</i>	1 2 3 - 5	- - i o u		
<i>Trifolium maritimum</i>	1 2 3 - 5	- - i o u		
<i>Arabis stricta</i> , 51	1 - - - 5	- - i - -		
<i>Carex clandestina</i> , 51	1 2 - - 5	- - i ? -		
<i>Polygala calcarea</i> , 51	- 2 3 - 5	- - - o u		



<i>Euphorbia stricta</i> , 51	-	2	-	-	5	-	-	i	o	-
<i>Thlaspi perfoliatum</i> , 51	-	-	3	-	5	-	-	-	o	-
<i>Allium sphærocephalum</i> , 51	-	-	-	-	5	-	-	i	-	-
<i>Rubus imbricatus</i> , 51	-	-	-	-	5	-	-	i	-	-
<i>Sibthorpia europæa</i>	1	2	-	-	-	6	-	e	i	o
<i>Rhynchospora fusca</i>	1	2	-	-	-	6	-	e	i	-
<i>Agrostis setacea</i>	1	2	-	-	-	6	-	e	i	o
<i>Cicendia filiformis</i>	1	2	-	-	-	6	-	e	i	o
<i>Cyperus longus</i>	1	2	3	-	-	6	-	e	i	o
<i>Erodium moschatum</i>	1	2	-	-	5	6	-	e	i	-
<i>Bromus madritensis</i>	1	2	3	-	5	6	-	e	i	o
<i>Verbascum Blattaria</i>	1	2	3	-	-	6	-	e	i	o
<i>Ranunculus tripartitus</i>	1	-	3	-	-	6	-	e	-	o
<i>Draba aizoides</i> , 51	-	-	-	-	-	6	-	-	i	-
<i>Arabis ciliata</i> , var., 51	-	-	-	-	-	6	-	e	-	-

3. *Southward of 53 lat. Temp. 49 Fahr. 9·4 cent.*

<i>Galium Vaillantii</i> , 52	-	-	3	?	-	-	-	-	u	
<i>Polypogon monspeliensis</i>	1	2	3	4	-	-	i	o	u	
<i>Ornithogalum pyrenaicum</i>	1	2	-	4	-	-	i	o	?	
<i>Centaurea Calcitrapa</i>	1	2	3	4	-	e	i	o	u	
<i>Vicia gracilis</i>	1	2	3	4	-	-	i	o	-	
<i>Leucojum æstivum</i>	-	2	3	4	-	-	i	o	u	
<i>Borkhausia fœtida</i>	-	2	3	4	-	-	-	o	u	
<i>Seseli Libanotis</i>	-	2	3	4	-	-	-	o	u	
<i>Dianthus prolifer</i>	-	2	3	4	-	-	-	o	u	
<i>Aira canescens</i>	-	2	3	4	-	-	i	-	u	
<i>Tillæa muscosa</i>	-	2	-	4	-	-	i	o	u	
<i>Polypogon littoralis</i>	-	2	3	4	-	-	i	o	u	
<i>Setaria viridis</i>	-	2	3	4	-	-	-	o	u	
<i>Frankenia lævis</i>	-	2	3	4	-	-	-	o	u	
<i>Melampyrum cristatum</i>	-	2	3	4	-	-	-	o	u	
<i>Ajuga Chamæpitys</i> , 51	-	2	3	4	-	-	i	o	u	
<i>Ophrys aranifera</i>	-	2	3	4	-	-	-	o	u	
<i>Digitaria humifusa</i>	-	2	3	4	-	-	-	o	u	
<i>Potamogeton acutifolius</i>	-	2	3	4	-	-	-	o	u	
<i>Poa bulbosa</i>	-	2	3	4	-	?	i	o	u	
<i>Schoberia fruticosa</i>	-	2	3	4	-	-	i	-	u	
<i>Filago spathulata</i>	-	2	3	4	-	-	i	o	u	

<i>Fumaria Vaillantii</i> , 51	- 2 3 4 - - - o u
<i>Trifolium ochroleucum</i>	- 2 3 4 - - ? o u
<i>Adonis autumnalis</i>	- 2 3 4 - - i o u
<i>Melampyrum arvense</i> , 50 ?	- ? 3 4 - - - ? u
<i>Orchis hircina</i> , 51	- - 3 4 - - - - u
<i>Primula elatior</i> , 51	- - 3 4 - - - - u
<i>Carum Bulbocastanum</i> , 51	- - 3 4 - - - o u
<i>Phleum Boehmeri</i> , 51	- - 3 4 - - - o u
<i>Medicago minima</i> , 51	- - 3 4 - - - - u
<i>Galium anglicum</i> , 51	- - 3 4 - - - - u
<i>Sonchus palustris</i> , 51	- - 3 4 - - - o u
<i>Iberis amara</i> , 51	- - 3 4 - - - o u
<i>Stachys germanica</i> , 51	- - 3 4 - - - o -
<i>Holosteum umbellatum</i> , 52	- - - 4 - - - - u
<i>Apera interrupta</i> , 52	- - - 4 - - - - u
<i>Veronica verna</i> , 52	- - - 4 - - - - u
<i>Liparis Loeselii</i> , 52	- - - 4 - - - ? u
<i>Muscari racemosum</i> , 52	- - - 4 - - - - u
<i>Potamogeton trichoides</i> , 52	- - - 4 - - - - u
<i>Cineraria palustris</i> , 52	- - - 4 - - - ? u
<i>Statice caspia</i> , 52	- - - 4 - - - - u
<i>Silene Otites</i> , 52	- - - 4 - - - ? u
<i>Medicago sylvestris</i> , 52	- - - 4 - - - - u
<i>Medicago falcata</i> , 52	- - - 4 - - - - u
<i>Artemisia campestris</i> , 52	- - - 4 - - - - u
<i>Chenopodium botryoides</i> , 52	- - - 4 - - - - u
<i>Verbascum floccosum</i> , 52	- - - 4 - - - - u
<i>Delphinium Consolida</i> , 52	- - - 4 - - - o u
<i>Cephalanthera rubra</i> , 51	1 - - 4 5 - - i o -
<i>Phleum asperum</i> , 51	? - 3 4 ? - - ? o u
<i>Thesium humifusum</i>	1 2 3 4 5 - - i o u
<i>Hermidium Monorchis</i>	1 2 3 4 5 - - i o u
<i>Alopecurus bulbosus</i>	1 2 3 4 5 - - i o u
<i>Geranium rotundifolium</i>	1 2 3 4 5 - e i o u
<i>Mespilus germanica</i>	1 2 3 - 5 - - i o u
<i>Ceanothë pimpinelloides</i>	1 2 3 - 5 - - i o u
<i>Sedum album</i> , 51	1 2 - - 5 - - i - -
<i>Rubus Guntheri</i>	1 - 3 - 5 - e i o -
<i>Poterium muricatum</i>	1 2 3 4 5 - - i o u

Chenopodium hybridum, 51	1	2	3	4	5	-	-	i	o	u
Fritillaria Meleagris, 51	1	2	3	4	5	-	-	i	o	u
Orobanchæ cærulea	-	2	3	4	5	-	-	i	o	u
Spiranthes æstivalis	-	2	-	-	5	-	-	i	o	-
Carex montana, 51	-	2	-	-	5	-	-	i	-	u
Lactuca saligna	-	2	3	4	5	-	-	i	-	u
Pulicaria vulgaris	-	2	3	4	5	-	-	i	o	u
Actinocarpus Damasonium	-	2	3	4	5	-	-	i	o	u
Villarsia nymphæoides, 51.	-	-	3	4	5	-	-	-	o	u
Cynoglossum sylvaticum, 51	-	-	3	4	5	-	?	i	o	u
Lactuca Scariola, 51	-	-	3	4	5	-	-	i	-	u
Epipogium aphyllum, 52	-	-	-	-	5	-	-	i	-	-
Rubus pampinosus, 52	-	-	-	-	5	-	-	i	-	-
Rubus Balfourianus, 52	-	-	-	-	5	-	-	i	-	-
Rubus fissus, 52	-	-	-	-	5	-	-	i	-	-
Euphorbia Peplis	1	2	-	-	-	6	-	e	i	o -
Melittis Melissophyllum	1	2	-	-	5	6	-	e	i	o -
Genista pilosa	1	2	-	4	-	6	-	e	-	- u
Trifolium glomeratum	1	2	3	4	-	6	-	?	i	o u
Gastroidium lendigerum	1	2	3	4	5	6	-	e	i	o u
Lepidium ruderaie	1	2	3	4	5	6	-	e	i	o u
Calamintha Nepeta	1	2	3	4	5	6	-	e	i	o u
Luzula Forsteri	1	2	3	-	5	6	-	e	i	o u
Rosa systyla	1	2	3	-	5	6	-	e	i	o u
Orobanchæ picridis	-	2	-	4	-	6	-	e	-	o u
Scleranthus perennis, 52	-	-	-	4	-	6	-	-	i	- u
Juncus acutus	1	2	3	-	-	6	7	-	e	i o u
Vinca minor	1	2	3	4	5	-	7	-	e	i o u
Potentilla rupestris, 52	-	-	-	-	-	-	7	-	-	i - -
Cuscuta europæa	1	2	3	4	5	-	-	8	-	- i o u
Cœnanthe fluviatilis	1	2	3	4	5	-	-	8	-	- i o u
Lythrum hyssopifolium	1	-	3	4	-	-	-	8	-	- i o u
Herniaria glabra	1	-	-	4	-	-	-	8	-	e - o -
Cœnanthe silâifolia	-	2	3	4	5	-	-	8	-	- i o u
Rubus scaber, 51	-	-	3	-	5	-	7	8	-	- i o u
Senecio paludosus, 52	-	-	-	4	-	-	-	8	-	- - - u
Rubus Bloxamii, 52	-	-	-	-	5	-	-	8	-	- - o -
Rubus Grabowskii, 52	-	-	-	-	-	-	-	8	-	- - o -

4. Southward of 54 lat. Temp.  $48\frac{1}{2}$  fahr. 9·1 cent.

Coronopus didyma	1	2	-	-	-	6	7	-	e	i	o	-	
Asplenium lanceolatum	1	2	3	-	5	6	7	-	e	i	-	u	
Carex punctata ?	1	-	-	-	-	-	7	-	e	-	-	-	
Trifolium strictum	1	-	-	-	-	-	7	-	e	-	-	-	
Diotis maritima	1	-	-	4	-	-	7	-	e	-	-	u	
Matthiola sinuata	1	-	-	-	-	6	7	-	e	i	-	-	
Trifolium suffocatum	1	2	3	4	-	-	7	-	e	i	o	u	
Rubia peregrina	1	2	3	-	5	6	7	-	e	i	o	u	
Chrysoma Linosyris	1	-	-	-	-	-	7	-	-	i	-	-	
Hypochoëris maculata	1	-	3	4	-	-	7	-	e	i	-	u	
Lithospermum p. cæruleum	1	-	3	4	-	6	7	-	-	i	o	u	
Viola Curtisii	1	-	-	-	-	6	7	-	e	-	-	-	
Antirrhinum Orontium	1	2	3	4	5	6	7	-	e	i	o	u	
Orobanche hederæ	1	2	-	-	5	6	7	-	e	i	o	-	
Rubus pyramidalis, 51	1	-	-	-	5	-	7	-	-	i	-	-	
Daucus maritimus	1	2	3	-	-	6	7	-	e	i	o	u	
Fœniculum vulgare	1	2	3	4	5	6	7	-	e	i	o	u	
Brassica oleracea	1	2	3	-	-	6	7	-	e	i	o	-	
Verbascum Lychnitis, 51	1	2	3	-	5	-	7	-	-	i	o	u	
Aconitum Napellus, 51	1	-	-	-	5	6	7	-	-	i	-	-	
Cineraria campestris	-	2	3	4	5	-	7	-	e	i	o	u	
Campanula Rapunculus, 51	-	2	3	-	5	-	7	-	?	-	o	u	
Alopecurus fulvus	-	2	3	4	5	-	7	-	-	i	o	u	
Elatine Hydropiper, 51	-	-	3	-	5	-	7	-	e	i	o	-	
Borkhausia taraxacifolia, 51	-	-	3	4	-	-	7	-	e	-	o	u	
Sedum Forsterianum, 52	-	-	-	-	5	6	7	-	?	i	-	-	
Helianthemum Breweri, 53	-	-	-	-	-	-	7	-	e	-	-	-	
Knappia agrostidea, 53	-	-	-	-	-	-	7	-	e	-	-	-	
Cotoneaster vulgaris, 53	-	-	-	-	-	-	7	-	-	-	i	-	
Spartina stricta	1	2	3	4	-	-	-	8	-	-	i	o	u
Viola stagnina	1	-	-	4	-	-	-	8	-	-	i	o	-
Lathyrus Aphaca	1	2	3	4	5	-	-	8	-	-	i	o	u
Latnyrus Nissolia	1	2	3	4	5	-	-	8	-	e	i	o	u
Althæa officinalis	1	2	3	4	5	6	-	8	-	e	i	o	u
Carduus acaulis	1	2	3	4	5	6	-	8	-	-	i	o	u
Rumex pulcher	1	2	3	4	5	6	-	8	-	e	i	o	u
Carpinus Betulus	1	2	3	4	5	-	-	8	-	e	i	o	u



<i>Verbascum nigrum</i>	1	2	3	4	5	6	-	8	-	e	i	o	u
<i>Rumex maritimus</i>	1	2	3	4	5	-	-	8	-	-	i	o	u
<i>Erysimum cheiranthoides</i>	1	2	3	4	5	6	7	8	-	e	i	o	u
<i>Sedum reflexum</i>	1	2	3	4	5	6	7	8	-	e	i	o	u
<i>Aceras anthropophora</i> , 50?	-	2	3	4	-	-	-	8	-	-	-	o	u
<i>Rubus thyrsoides</i> , 51	-	-	3	4	5	6	-	8	-	e	i	o	-
<i>Atriplex pedunculata</i> , 51	-	-	3	4	-	-	-	8	-	-	-	o	u
<i>Asparagus officinalis</i>	1	2	-	-	5	6	7	-	9	-	e	i	-
<i>Statice Dodartii</i>	1	-	-	4	-	6	7	-	9	-	?	i	-
<i>Pyrus torminalis</i>	1	2	3	4	5	6	7	8	9	-	e	i	o
<i>Melilotus arvensis</i>	-	2	3	4	-	-	-	-	9	-	-	i	o
<i>Lastrea cristata</i> , 52	-	-	-	4	-	-	-	8	9	-	-	i	o
<i>Crocus nudiflorus</i> , 52	-	-	-	-	5	-	-	8	9	-	-	i	o
<i>Erythræa latifolia</i> , 53 (51?)	-	-	-	-	-	-	-	-	9	-	-	i	-
<i>Arenaria tenuifolia</i>	1	2	3	4	5	-	7	-	-	10			
<i>Festuca uniglumis</i>	1	2	3	4	-	6	7	-	9	10			
<i>Carex divisa</i>	1	2	3	4	-	6	7	8	-	10			
<i>Petroselinum segetum</i>	1	2	3	4	5	6	-	8	-	10			
<i>Lathyrus palustris</i> , 50?	1	2	-	4	5	-	7	8	-	10			
<i>Sison Amomum</i>	1	2	3	4	5	6	7	8	9	10			
<i>Potamogeton flabellatus</i>	1	2	3	4	5	-	-	8	-	10			
<i>Peucedanum palustre</i> , 51	1	-	-	4	-	-	-	8	-	10			
<i>Carex strigosa</i>	1	2	3	4	5	6	7	8	9	10			
<i>Filago apiculata</i> , 51	-	2	3	4	5	-	-	-	-	10			
<i>Apera Spica-venti</i> , 51	-	2	3	4	-	-	-	-	-	10			
<i>Stratiotes aloides</i> , 51	-	-	-	4	-	-	-	8	9	10			
<i>Veronica triphyllos</i> , 52	-	-	-	4	-	-	-	-	-	10			
<i>Carex paradoxa</i> , 53	-	-	-	-	-	-	-	-	-	10			

5. Southward of 55 lat. Temp. 48 fahr. 8·8 cent.

<i>Vicia bithynica</i>	1	2	3	-	5	6	7	-	-	10			
<i>Linaria spuria</i>	1	2	3	4	5	6	-	8	-	10			
<i>Trifolium subterraneum</i>	1	2	3	4	5	6	7	8	9	10			
<i>Carex digitata</i> , 51	1	2	-	-	5	-	-	8	-	10			
<i>Carduus pratensis</i>	1	2	3	4	5	6	-	8	-	10			
<i>Orobanche minor</i>	1	2	3	4	5	6	-	-	-	10			
<i>Rumex pratensis</i>	1	2	3	4	5	6	7	-	-	10			
<i>Teucrium Scordium</i>	1	-	3	4	-	-	-	8	-	10			
<i>Chlora perfoliata</i>	1	2	3	4	5	6	7	8	9	10			

<i>Orobanche elatior</i>	1	2	3	4	5	-	-	-	-	10
<i>Campanula patula</i>	1	2	3	-	5	6	-	8	-	10
<i>Linaria Elatine</i>	1	2	3	4	5	6	7	8	-	10
<i>Rumex palustris</i>	1	2	3	4	5	6	-	-	9	10
<i>Euphorbia platyphylla</i>	1	2	3	4	5	-	-	-	-	10
<i>Acorus Calamus</i>	1	2	3	4	5	6	-	8	9	10
<i>Lamium Galeobdolon</i>	1	2	3	4	5	6	7	8	9	10
<i>Torilis infesta</i>	1	2	3	4	5	6	7	8	9	10
<i>Clematis Vitalba</i>	1	2	3	4	5	6	7	-	-	10
<i>Brachypodium pinnatum</i>	1	2	3	4	5	-	-	8	-	10
<i>Dipsacus pilosus</i>	1	2	3	4	5	-	7	8	-	10
<i>Sinapis muralis</i>	1	2	3	4	5	6	-	-	-	10
<i>Viscum album</i>	1	2	3	4	5	-	7	8	9	10
<i>Festuca Pseudo-myurus</i>	1	2	3	4	5	6	7	8	9	10
<i>Chenopodium polyspermum</i>	1	2	3	4	5	6	7	8	-	10
<i>Cerastium aquaticum</i>	1	2	3	4	5	6	7	8	9	10
<i>Viburnum Lantana</i>	1	2	3	4	5	6	-	8	-	10
<i>Pyrus communis</i>	1	2	3	4	5	-	7	8	-	10
<i>Medicago denticulata</i>	1	2	3	4	5	-	-	-	9	10
<i>Nasturtium amphibium</i>	1	2	3	4	5	-	-	8	9	10
<i>Epilobium roseum</i>	1	2	3	-	5	6	-	8	-	10
<i>Carex Pseudo-cyperus</i>	1	2	3	4	5	-	7	8	9	10
<i>Carex divulsa</i>	1	2	3	4	5	-	7	8	-	10
<i>Carex axillaris</i>	1	2	3	4	5	-	-	8	9	10
<i>Brassica campestris</i>	1	2	3	4	5	6	7	8	9	10
<i>Fagus sylvatica</i>	1	2	3	4	5	6	-	8	9	10
<i>Rosa rubiginosa</i>	1	2	3	4	5	-	7	8	9	10
<i>Geranium pyrenaicum</i>	1	2	3	4	5	6	7	-	-	10
<i>Potamogeton compressus</i>	1	2	3	4	5	-	-	8	9	10
<i>Rubus Hystrix</i>	1	2	3	4	5	6	-	8	-	10
<i>Rubus fusco-ater</i>	1	2	3	-	5	6	7	8	9	10
<i>Rubus discolor</i>	1	2	3	4	5	6	7	8	-	10
<i>Barbarea arcuata</i> , 51	-	2	3	-	5	-	7	-	-	10
<i>Salicornia radicans</i>	-	2	3	4	-	-	-	-	-	10
<i>Galium erectum</i>	-	2	3	4	-	-	-	-	-	10
<i>Anemone Pulsatilla</i> , 51	-	-	3	4	5	-	-	8	-	10
<i>Carex elongata</i> , 51	-	-	3	-	5	-	-	-	9	10
<i>Polygonum mite</i> , 51	-	-	3	4	-	6	-	-	-	10
<i>Lepidium latifolium</i> , 51	-	-	3	4	-	-	7	-	9	10

<i>Hippophae rhamnoides</i> , 51	-	-	3	4	-	-	-	8	-	10	
<i>Crepis biennis</i> , 51	-	-	3	4	-	-	-	8	-	10	
<i>Cyperus fuscus</i> , 51	-	-	3	-	-	-	-	-	-	10	
<i>Eriophorum gracile</i> , 51	-	-	3	-	-	-	-	-	-	10	
<i>Barbarea stricta</i> , 51	-	-	-	-	5	-	-	-	-	10	
<i>Specularia hybrida</i>	1	2	3	4	5	-	-	8	-	10	11
<i>Caucalis daucoides</i> , 51	1	2	3	4	5	-	-	8	-	10	11
<i>Bupleurum rotundifolium</i>	1	2	3	4	5	-	-	8	-	10	11
<i>Papaver hybridum</i>	1	2	3	4	5	-	7	-	9	-	11
<i>Galium tricornae</i>	1	2	3	4	5	6	-	8	-	10	11
<i>Eryngium campestre</i>	1	-	-	4	-	6	-	-	-	-	11
<i>Ranunculus parviflorus</i>	1	2	3	4	5	6	7	8	9	10	11
<i>Ophrys apifera</i>	1	2	3	4	5	6	7	8	-	10	11
<i>Bupleurum tenuissimum</i>	1	2	3	4	5	-	-	8	9	-	11
<i>Bryonia dioica</i>	1	2	3	4	5	-	7	8	9	10	11
<i>Myriophyllum verticillatum</i>	1	2	3	4	5	-	-	8	9	10	11
<i>Hydrocharis Morsus-ranæ</i>	1	2	3	4	5	6	7	8	9	10	11
<i>Butomus umbellatus</i>	1	2	3	4	5	6	7	8	9	10	11
<i>Iris foetidissima</i>	1	2	3	4	5	6	7	8	-	10	11
<i>Hordeum maritimum</i>	1	2	3	4	5	6	-	8	9	10	11
<i>Onobrychis sativa</i>	1	2	3	4	5	-	7	8	-	10	11
<i>Chenopodium urbicum</i>	1	-	3	4	5	-	-	-	9	10	11
<i>Solanum nigrum</i>	1	2	3	4	5	6	7	8	9	10	11
<i>Medicago maculata</i>	1	2	3	4	5	6	7	8	-	10	11
<i>Carduus eriophorus</i>	1	2	3	4	5	6	-	8	-	10	11
<i>Ruscus aculeatus</i>	1	2	3	4	-	6	-	8	-	10	11
<i>Ligustrum vulgare</i>	1	2	3	4	5	6	7	8	-	10	11
<i>Myosurus minimus</i>	1	2	3	4	5	-	-	8	9	10	11
<i>Helminthia echinoides</i>	1	2	3	4	5	6	7	8	9	10	11
<i>Cuscuta Trifolii</i>	-	2	3	4	5	-	-	-	9	10	11
<i>Rubus Salteri</i>	-	2	-	-	5	-	7	8	-	-	11
<i>Helleborus foetidus</i>	-	2	3	4	5	-	7	-	-	10	11
<i>Galeopsis ochroleuca</i> , 51	-	-	3	-	5	-	7	8	9	10	11
<i>Linum perenne</i> , 51	-	-	3	4	-	-	-	8	-	10	11
<i>Adiantum Capillus</i>	1	-	-	-	-	6	-	-	-	-	12
<i>Lavatera arborea</i>	1	2	-	-	-	6	7	-	-	-	12
<i>Linum angustifolium</i>	1	2	3	-	5	6	7	-	9	-	12
<i>Hottonia palustris</i>	1	2	3	4	5	-	7	8	9	10	11
<i>Spiranthes autumnalis</i>	1	2	3	4	5	6	7	8	9	10	-

<i>Colchicum autumnale</i>	1	2	3	4	5	6	7	8	9	10	11	12
<i>Ophrys muscifera</i>	1	2	3	4	5	-	7	8	-	10	-	12
<i>Inula Conyza</i>	1	2	3	4	5	6	7	8	9	10	-	12
<i>Asperula cynanchica</i>	1	2	3	4	5	6	-	-	9	10	-	12
<i>Polypodium calcareum</i>	1	2	3	-	5	6	7	8	9	10	11	12
<i>Linaria repens</i>	1	2	3	4	5	6	-	-	-	10	-	12
<i>Calamintha officinalis</i>	1	2	3	4	5	6	7	8	9	10	11	12
<i>Rhamnus catharticus</i>	1	2	3	4	5	6	7	8	-	10	11	12
<i>Mentha Pulegium</i>	1	2	3	4	5	6	7	8	9	10	11	12
<i>Campanula Trachelium</i>	1	2	3	4	5	6	7	8	-	10	-	12
<i>Atropa Belladonna</i>	1	2	3	4	5	6	7	8	9	10	11	12
<i>Euphorbia Paralias</i>	1	2	3	-	-	6	7	-	9	-	-	12
<i>Tamus communis</i>	1	2	3	4	5	6	7	8	9	10	11	12
<i>Orchis ustulata</i>	1	2	3	4	5	-	-	8	9	10	11	12
<i>Orchis Morio</i>	1	2	3	4	5	6	7	8	9	10	11	12
<i>Tilia parvifolia</i>	1	2	3	4	5	6	-	8	-	-	-	12
<i>Prunus Cerasus</i>	1	2	3	4	5	6	7	8	9	-	-	12
<i>Agrimonia odorata</i>	1	2	3	-	5	6	-	-	-	-	-	12
<i>Rubus glandulosus</i>	1	2	3	-	5	-	7	8	-	10	-	12
<i>Rubus leucostachys</i>	1	2	3	-	5	6	7	8	-	10	-	12
<i>Hypericum montanum</i>	1	2	3	4	5	6	7	8	9	10	11	12
<i>Verbena officinalis</i>	1	2	3	4	5	6	7	8	9	10	11	12
<i>Lactuca muralis</i>	1	2	3	4	5	6	7	8	9	10	11	12
<i>Alopecurus agrestis</i>	1	2	3	4	5	6	-	8	9	10	11	12
<i>Helleborus viridis</i>	1	2	3	4	5	-	-	-	-	10	11	12
<i>Viola odorata</i>	1	2	3	4	5	6	7	8	9	10	11	12
<i>Impatiens Noli, 51</i>	1	-	-	-	-	-	7	-	9	-	-	12
<i>Lysimachia nummularia</i>	1	2	3	4	5	6	7	8	9	10	-	12
<i>Acer campestre</i>	1	2	3	4	5	6	7	8	9	10	11	12
<i>Taxus baccata</i>	1	2	3	-	5	6	7	8	-	10	11	12
<i>Cornus sanguinea</i>	1	2	3	4	5	6	7	8	9	10	11	12
<i>Inula Helenium</i>	1	2	3	4	5	6	7	-	-	10	11	12
<i>Anchusa sempervirens</i>	1	2	3	4	5	6	7	8	-	10	-	12
<i>Ribes nigrum, 51</i>	1	2	3	4	5	6	7	-	-	10	11	12
<i>Ribes Grossularia</i>	1	2	3	4	5	6	7	8	9	10	11	12
<i>Hieracium tridentatum</i>	1	2	3	4	5	-	-	8	9	10	11	12
<i>Daphne Mezereum</i>	-	2	3	-	-	-	-	8	-	10	-	12
<i>Gentiana Pneumonanthe</i>	-	2	3	4	-	6	7	8	9	10	-	12
<i>Juncus diffusus</i>	-	2	3	4	5	-	-	8	-	10	11	12





<i>Narcissus P. narcissus</i>	1	2	3	4	5	6	7	8	9	10	11	12	
<i>Humulus Lupulus</i>	1	2	3	4	5	6	7	8	9	10	11	12	
<i>Pastinaca sativa</i>	1	2	3	4	5	6	-	8	9	10	11	-	13
<i>Sagittaria sagittifolia</i>	1	2	3	4	5	6	7	8	9	10	11	12	13
<i>Aquilegia vulgaris</i>	1	2	3	4	5	6	7	8	9	10	11	12	13
<i>Crithmum maritimum</i>	1	2	3	-	-	6	7	-	-	-	-	12	13
<i>Anagallis cærulea</i>	1	2	3	4	5	6	-	8	9	10	11	12	13
<i>Serratula tinctoria</i>	1	2	3	4	5	6	7	8	9	10	11	12	13
<i>Wahlenbergia hederacea</i>	1	2	3	-	5	6	7	-	9	10	-	12	13
<i>Rubus Koehleri</i>	1	2	3	-	5	6	-	8	-	10	-	12	13
<i>Rubus corylifolius</i>	1	2	3	4	5	6	7	8	9	10	-	-	13
<i>Ranunculus cœnosus</i>	1	2	3	-	5	6	7	8	9	10	-	12	13
<i>Dentaria bulbifera</i> , 51	-	2	3	-	5	-	-	-	-	-	-	-	13
<i>Zostera nana</i>	-	2	-	-	-	-	-	-	-	-	11	-	13
<i>Rubus nemorosus</i>	-	2	3	4	5	6	-	8	-	10	-	12	13
<i>Rubus nitidus</i>	-	2	3	4	5	6	-	8	-	10	-	12	13
<i>Arum maculatum</i>	1	2	3	4	5	6	7	8	9	10	11	12	13 ?
<i>Polystichum angulare</i>	1	2	3	4	5	6	7	8	9	10	-	12	- 14
<i>Chenopodium olidum</i>	1	2	3	4	-	-	-	8	9	10	11	-	- 14
<i>Ranunculus circinatus</i>	1	2	3	4	5	6	-	8	9	10	11	-	- 14
<i>Ranunculus fluitans</i>	1	2	3	4	5	6	7	8	-	10	-	-	- 14
<i>Lemna polyrrhiza</i>	1	2	3	4	5	6	7	8	9	10	-	-	13 14
<i>Lemna gibba</i>	1	2	3	4	5	6	-	8	9	10	-	-	- 14
<i>Potamogeton densus</i>	1	2	3	4	5	6	7	8	-	10	11	12	13 14
<i>Ceratophyllum submersum</i>	1	2	3	4	-	-	-	-	-	-	-	-	- 14
<i>Genista tinctoria</i>	1	2	3	4	5	6	7	8	9	10	11	12	13 14
<i>Silene pratensis</i>	1	2	3	4	5	6	7	8	9	10	11	12	- 14
<i>Limosella aquatica</i>	1	2	3	4	5	-	7	8	9	10	11	-	- 14
<i>Lepturus filiformis</i>	1	2	3	4	5	6	7	8	9	10	11	12	13 14
<i>Blysmus compressus</i>	1	2	3	4	5	-	7	8	9	10	11	12	13 14
<i>Epipactis media</i>	1	2	3	4	5	-	-	8	-	10	-	12	- 14
<i>Euonymus europæus</i>	1	2	3	4	5	6	7	8	-	10	11	12	13 14
<i>Juncus obtusiflorus</i>	1	2	3	4	5	-	7	8	9	10	11	-	13 14
<i>Ballota nigra</i>	1	2	3	4	5	6	7	8	9	10	11	12	13 14
<i>Ranunculus arvensis</i>	1	2	3	4	5	6	7	8	9	10	11	12	13 14
<i>Matricaria Chamomilla</i>	1	2	3	4	5	6	7	8	9	10	11	12	13 14
<i>Œnanthe Phellandrium</i>	1	2	3	4	5	-	7	8	9	10	11	12	- 14
<i>Linaria minor</i>	1	2	3	4	5	6	7	8	-	10	11	-	13 14
<i>Senecio crucifolius</i>	1	2	3	4	5	6	7	8	9	10	11	12	13 14

<i>Mentha rotundifolia</i>	1	2	3	4	5	6	7	8	-	10	-	12	-	14
<i>Rosa arvensis</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<i>Sinapis nigra</i>	1	2	3	4	5	6	7	8	9	10	11	-	13	14
<i>Nepeta cataria</i>	1	2	3	4	5	6	7	8	-	10	11	-	13	14
<i>Chelidonium majus</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<i>Pyrus Malus</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<i>Carduus nutans</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<i>Sambucus Ebulus</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<i>Sedum Telephium</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<i>Rubus rudis</i>	1	2	3	-	5	6	7	8	-	10	-	-	13	14
<i>Rubus Radula</i>	1	2	3	4	5	6	7	8	-	10	-	-	13	14
<i>Rubus macrophyllus</i>	1	2	3	-	5	6	7	8	-	10	-	12	13	14
<i>Scrophularia Ehbarti</i>	-	2	3	-	5	-	7	-	9	10	-	-	-	14
<i>Carex stricta</i> , 51	-	2	3	4	5	-	7	-	9	10	-	12	13	14
<i>Sisymbrium Irio</i> , 51	-	-	3	4	-	6	-	-	-	-	-	-	-	14
<i>Fumaria parviflora</i> , 51	-	-	3	4	-	-	-	-	-	-	-	-	-	14
<i>Sium latifolium</i>	1	2	3	4	5	6	7	8	-	10	11	-	-	15
<i>Raphanus maritimus</i>	1	2	-	-	6	-	9	-	-	12	13	-	-	16
<i>Crambe maritima</i>	1	2	3	4	-	6	7	8	-	10	-	12	13	16
<i>Anthemis nobilis</i>	1	2	3	4	5	6	7	8	9	10	11	-	-	16
<i>Rumex Hydrolapath.</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	16
<i>Scirpus Savii</i>	1	2	-	4	-	6	7	-	9	-	12	13	-	16
<i>Bartsia viscosa</i>	1	2	-	-	6	-	9	-	-	-	13	-	-	16
<i>Scutellaria minor</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	16
<i>Rubus rhamnifolius</i>	1	2	3	4	5	6	7	8	9	10	-	-	-	16
<i>Helosciadium nodifl.</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	16
<i>Pulicaria dysenterica</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	16
<i>Apium graveolens</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	16
<i>Smyrniolum Olusatrum</i>	1	2	3	4	5	6	7	8	9	10	11	-	13	16
<i>Mentha sylvestris</i>	1	2	3	4	5	6	7	8	-	10	-	-	-	16
<i>Triticum laxum</i>	-	2	3	-	-	6	-	8	-	10	11	-	-	16
<i>Sinapis monensis</i> , 51	-	-	-	-	-	6	7	-	9	-	-	12	13	16

7. Southward of 57 lat. Temp. 47 fahr. 8·2 cent.

<i>Veronica Buxbaumii</i>	1	2	3	4	5	6	-	8	9	10	11	-	13	14	15
<i>Mercurialis annua</i>	1	2	3	4	5	6	7	8	9	-	-	-	-	-	15
<i>Senecio saracenicus</i>	1	2	3	-	5	-	7	8	9	10	-	-	13	14	15
<i>Saponaria officinalis</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Onopordum Acanthm.</i>	1	2	3	4	5	6	-	8	9	10	11	12	-	14	15

<i>Sinapis tenuifolia</i>	1	2	3	4	5	6	7	-	9	10	11	12	-	14	15
<i>Melilotus vulgaris</i>	1	2	3	4	5	6	-	-	9	-	-	12	-	14	15
<i>Melilotus officinalis</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Fedia Auricula</i>	1	2	3	-	5	6	-	-	-	10	-	-	-	-	15
<i>Anthemis Cotula</i>	1	2	3	4	5	6	7	8	9	10	11	-	13	14	15
<i>Marrubium vulgare</i>	1	2	3	4	5	6	7	8	9	10	11	-	-	14	15
<i>Daphne Laureola</i>	1	2	3	4	5	-	7	8	-	10	11	-	13	14	15
<i>Salix rubra</i> , etc.	1	2	3	4	5	-	7	8	-	10	11	12	-	14	15
<i>Typha angustifolia</i>	1	2	3	4	5	6	7	8	9	10	11	-	13	-	15
<i>Trigonella ornithopod.</i>	1	2	3	4	5	-	7	-	9	-	-	12	13	14	15
<i>Thrinia hirta</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Stellaria glauca</i>	1	2	3	4	5	-	7	8	9	10	11	-	13	14	15
<i>Trifolium fragiferum</i>	1	2	3	4	5	6	7	8	9	10	11	-	-	14	15
<i>Nasturtium sylvestre</i>	1	2	3	4	5	6	-	8	9	10	11	-	13	14	15
<i>Bromus erectus</i>	1	2	3	4	5	-	7	8	-	10	-	-	-	14	15
<i>Dipsacus sylvestris</i>	1	2	3	4	5	6	7	8	9	10	11	12	-	-	15
<i>Salvia verbenaca</i>	1	2	3	4	5	6	7	8	9	10	11	-	-	14	15
<i>Glyceria loliacea</i>	1	2	3	4	-	6	7	-	-	10	11	12	13	14	15
<i>Glyceria plicata</i>	1	2	3	4	5	-	7	8	9	10	11	-	-	14	15
<i>Festuca arundinacea</i>	1	2	-	-	-	-	-	8	-	-	11	-	-	-	15
<i>Artemisia Absinthium</i>	1	2	3	4	5	6	7	8	9	10	11	12	-	14	15
<i>Berberis vulgaris</i>	1	2	3	4	5	-	-	8	-	10	11	12	13	14	15
<i>Lactuca virosa</i>	1	2	3	4	5	6	-	8	-	10	11	-	-	14	15
<i>Hordeum pratense</i>	1	2	3	4	5	6	7	8	9	10	11	-	-	14	15
<i>Pimpinella magna</i>	1	2	3	4	5	-	-	8	9	10	11	-	-	-	15
<i>Poterium Sanguisorba</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Cephalanthera grandfl.</i>	1	2	3	4	5	-	-	8	-	-	-	12	-	-	15
<i>Stachys Betonica</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Scirpus acicularis</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Myosotis palustris</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Lastrea spinulosa</i>	1	2	3	4	5	6	-	8	9	10	-	12	-	-	15
<i>Lathræa squamaria</i>	1	2	3	4	5	-	7	8	9	10	11	12	13	14	15
<i>Dianthus Armeria</i>	1	2	3	4	5	6	7	-	9	10	11	12	-	-	15
<i>Torilis nodosa</i>	1	2	3	4	5	6	7	8	9	10	11	12	-	14	15
<i>Euphorbia exigua</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Carduus tenuiflorus</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Vicia tetrasperma</i>	1	2	3	4	5	6	7	8	9	10	11	-	13	-	15
<i>Lastrea Thelypteris</i>	1	2	3	4	5	6	7	8	9	10	11	12	-	-	15
<i>Artemisia maritima</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15



<i>Spiræa Filipendula</i>	1	2	3	4	5	-	7	8	9	10	11	12	-	14	15	
<i>Plantago media</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
<i>Erigeron acris</i>	1	2	3	4	5	6	7	8	9	10	11	12	-	-	15	
<i>Apargia hispida</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
<i>Glyceria distans</i>	1	2	3	4	5	6	7	8	9	10	11	12	-	14	15	
<i>Allium oleraceum</i>	1	2	3	4	5	6	-	8	-	10	11	12	-	-	15	
<i>Lemna trisulca</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
<i>Ceratophyl. demersum</i>	1	2	3	4	5	6	7	8	9	10	11	-	-	14	15	
<i>Sagina apetala</i>	1	2	3	4	5	6	7	8	9	10	11	-	13	14	15	
<i>Epilobium hirsutum</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
<i>Trifolium minus</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
<i>Salix triandra</i>	1	2	3	4	5	6	7	8	9	10	11	-	-	14	15	
<i>Hippocrepis comosa</i>	1	2	3	4	5	6	7	8	-	10	-	12	-	-	15	
<i>Silene nutans</i>	1	2	3	-	5	-	7	8	-	10	-	-	-	-	15	
<i>Viola hirta</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
<i>Campanula glomerata</i>	1	2	3	4	5	6	-	8	-	10	11	12	-	14	15	
<i>Cynoglossum officinale</i>	1	2	3	4	5	6	7	8	9	10	11	12	-	14	15	
<i>Vicia lutea</i>	1	2	-	4	-	-	-	-	-	-	-	-	13	-	15	
<i>Trifolium scabrum</i>	1	2	3	4	5	6	7	-	9	10	11	-	-	14	15	
<i>Trifolium striatum</i>	1	2	3	4	5	6	7	8	9	10	11	12	-	14	15	
<i>Juncus glaucus</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
<i>Hordeum murinum</i>	1	2	3	4	5	6	7	8	9	10	11	12	-	14	15	
<i>Potamogeton gramin.</i>	1	2	3	4	5	-	-	8	9	10	11	-	13	14	15	
<i>Potamogeton lucens</i>	1	2	3	4	5	-	7	8	9	10	11	12	13	14	15	
<i>Glaucium luteum</i>	1	2	3	4	5	6	7	-	9	10	11	12	13	14	15	16
<i>Convolvulus Soldanel.</i>	1	2	3	4	-	6	7	8	9	-	11	12	13	-	15	16
<i>Hymenophyl. Tunbrg.</i>	1	2	3	-	-	6	7	-	-	10	-	12	13	-	-	16
<i>Carex lævigata</i>	1	2	3	-	5	6	7	-	9	10	11	12	13	14	-	16
<i>Cotyledon Umbilicus</i>	1	2	3	4	5	6	7	8	9	10	-	12	13	-	-	16
<i>Convolvulus sepium</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Elatine hexandra</i>	1	2	3	-	5	-	7	8	9	-	-	-	-	-	15	16
<i>Ceterach officinarum</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	-	15	16
<i>Thalictrum flavum</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Valeriana dioica</i>	1	2	3	4	5	6	7	8	9	10	11	12	-	14	15	16
<i>Salix Smithiana, etc.</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Lythrum Salicaria</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Bidens tripartita</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Habenaria chlorantha</i>	1	2	3	4	5	6	7	8	-	10	11	12	13	14	15	16
<i>Hypericum dubium</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

<i>Drosera intermedia</i>	1	2	3	4	5	6	7	8	9	10	-	12	13	-	-	16
<i>Ononis spinosa</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Scirpus glaucus</i>	1	2	3	4	5	6	7	8	-	10	-	-	13	14	15	16
<i>Cicuta virosa</i> , 51	1	2	3	4	5	-	-	8	-	10	-	-	13	-	15	16
<i>Lathyrus sylvestris</i>	1	2	3	4	5	6	7	8	-	10	-	12	13	14	15	16
<i>Ranunculus hirsutus</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Veronica polita</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Geranium columbin.</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Verbascum Thapsus</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Mentha sativa</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Carex intermedia</i>	1	2	3	4	5	6	7	8	9	10	11	-	13	14	15	16
<i>Hieracium umbellat.</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Hyoscyamus niger</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Sambucus nigra</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Ribes rubrum</i> , etc.	1	2	3	-	5	6	7	8	9	10	11	12	13	-	15	16
<i>Turritis glabra</i> , 51	-	2	3	4	5	-	-	8	-	10	11	12	13	-	15	16
<i>Cephalanthera ensifol.</i>	-	2	3	-	5	-	7	8	-	10	11	12	-	14	15	16
<i>Potamogeton plantag.</i>	-	2	3	4	-	6	7	8	-	10	11	12	-	14	-	16
<i>Rubus affinis</i>	-	2	3	-	5	6	7	8	-	10	-	12	13	-	15	16
<i>Rubus mucronat.</i> , 52	-	-	-	-	5	-	-	8	-	10	-	-	-	-	-	16
<i>Carum verticillat.</i> , 51	?	-	-	-	-	6	7	-	-	-	-	12	13	-	-	16

8. Southward of 58 lat. Temp.  $46\frac{1}{2}$  fahr. 7.9 cent.

<i>Chenopodium rubrum</i>	1	2	3	4	5	6	7	8	9	10	11	-	13	14	15
<i>Scabiosa columbaria</i>	1	2	3	4	5	6	7	8	9	10	11	12	-	14	15
<i>Symphytum officinale</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Allium vineale</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Phleum arenarium</i>	1	2	3	4	-	6	7	8	9	10	11	12	-	14	15
<i>Rubus villicaulis</i>	1	2	3	-	5	6	7	8	-	10	-	12	-	-	15
<i>Avena flavescens</i>	1	2	3	4	5	6	7	8	9	10	11	12	-	14	15
<i>Reseda lutea</i>	1	2	3	4	5	6	7	8	-	10	11	-	-	14	15
<i>Galium Mollugo</i>	1	2	3	4	5	6	-	8	-	10	11	12	13	14	15
<i>Malva rotundifolia</i>	1	2	3	4	5	6	7	8	9	10	11	-	13	14	15
<i>Centaurea Scabiosa</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Convolvulus arvensis</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Lamium album</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Papaver Rhœas</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Anthemis arvensis</i>	1	2	3	4	5	6	7	8	9	10	11	-	13	14	15
<i>Silene anglica</i>	1	2	3	4	5	6	7	8	9	10	-	12	13	14	15

<i>Coronopus Ruellii</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Barbarea vulgaris</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Fedia dentata</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Calamintha Acinos</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Hypochaeris glabra</i>	1	2	3	4	5	-	-	-	9	10	-	-	13	-	15
<i>Æthusa Cynapium</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Lepidium campestre</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Geranium pusillum</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Teesdalia nudicaulis</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Monotropa Hypopitys</i>	1	2	3	4	5	-	-	8	9	10	-	12	-	-	15
<i>Gagea lutea</i> , 51	1	-	3	4	5	-	-	8	9	10	11	12	13	14	15
<i>Convallaria majalis</i>	1	2	3	4	5	-	7	8	9	10	11	12	13	-	15
<i>Paris quadrifolia</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Melica uniflora</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Sium angustifolium</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Glyceria aquatica</i>	1	2	3	4	5	6	7	8	9	10	11	-	13	14	15
<i>Typha latifolia</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Ranunculus Lingua</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Rhamnus Frangula</i>	1	2	3	4	5	6	7	8	9	10	-	12	13	-	15
<i>Epipactis latifolia</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Carex pendula</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Carex teretiuscula</i>	1	2	3	4	5	6	7	8	9	10	-	-	13	14	15
<i>Carex riparia</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Centaurea nigrescens</i>	1	2	3	-	5	6	-	8	-	10	11	12	13	-	15
<i>Centunculus minimus</i>	1	2	3	4	5	6	7	-	9	10	-	12	13	14	15
<i>Potentilla argentea</i>	1	2	3	4	5	-	7	8	-	10	11	12	-	14	15
<i>Calamintha Clinopod.</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Cerastium semidecan.</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Galeopsis Ladanum</i>	1	2	3	4	5	6	-	8	9	10	11	12	13	14	15
<i>Galium uliginosum</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Viola flavicornis</i>	1	2	3	4	5	6	7	8	9	10	11	12	-	14	15
<i>Carex sylvatica</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Ranunculus auricomus</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Atriplex littoralis</i>	-	2	3	4	-	6	7	8	9	10	11	12	-	14	15
<i>Rubus plicatus</i>	-	2	3	-	5	6	7	8	9	10	-	12	13	14	15
<i>Carex Boenninghaus.</i>	-	2	3	-	-	-	-	-	-	-	-	-	-	14	15
<i>Dianthus deltoides</i>	-	2	3	4	5	-	7	8	9	10	11	12	-	14	15
<i>Saxifraga granulata</i>	-	2	3	4	5	-	7	8	9	10	11	12	13	14	15
<i>Fumaria micrantha</i>	-	2	3	4	5	-	-	8	-	-	11	-	-	14	15

<i>Arnosotis pusilla</i>	-	2	3	4	-	-	-	-	-	-	-	-	-	-	15
<i>Cerast. arvense</i> , 51 ?	-	2	3	4	5	-	7	8	9	10	11	12	13	14	15
<i>Rubus pallidus</i> , 51	-	-	3	4	5	6	7	8	-	10	11	12	13	-	15
<i>Silene noctiflora</i> , 51	-	-	3	4	5	-	-	8	-	10	11	-	-	14	15
<i>Silene conica</i> , 51	-	-	3	4	-	-	-	-	-	-	-	-	-	14	15
<i>Potamog. zosteræf.</i> , 51	-	-	3	4	5	-	-	8	-	-	-	-	-	-	15
<i>Potamog. prælong.</i> , 51	-	-	3	4	5	-	-	8	-	10	-	12	-	14	15
<i>Campanula rapun.</i> , 51	-	-	-	4	5	-	-	8	-	10	-	-	-	14	15
<i>Rubus latifolius</i> , 54	-	-	-	-	-	-	-	-	10	-	-	-	-	14	15
<i>Salix purpurea</i> , etc.	1	2	3	4	5	-	7	8	9	10	11	12	13	14	15 16
<i>Juncus maritimus</i>	1	2	3	4	-	6	7	8	9	10	11	12	13	-	15 16
<i>Œnanthe fistulosa</i>	1	2	3	4	5	6	7	8	9	10	11	-	13	14	15 16
<i>Mentha piperita</i>	1	-	3	4	5	6	7	8	9	10	11	12	-	14	15 16
<i>Cardamine amara</i>	1	2	3	4	5	-	7	8	9	10	11	12	13	14	15 16
<i>Milium effusum</i>	1	2	3	4	5	-	7	8	9	10	11	12	13	14	15 16
<i>Carex acuta</i>	1	2	3	4	5	6	7	8	9	10	11	-	13	14	15 16
<i>Neottia Nidus-avis</i>	1	2	3	4	5	6	7	8	-	10	11	12	13	14	15 16
<i>Sinapis alba</i>	1	2	3	4	5	6	7	8	9	10	11	-	13	14	15 16
<i>Salix fragilis</i> , etc.	1	2	3	4	5	6	7	8	9	10	11	-	13	14	15 16
<i>Rubus carpinifolius</i>	1	2	3	4	5	6	7	8	-	10	-	12	13	14	15 16
<i>Œnanthe Lachenalii</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	- 16
<i>Epipactis palustris</i>	1	2	3	4	5	6	7	8	9	10	11	12	-	14	15 16
<i>Polygonum Bistorta</i>	?	?	3	4	5	6	7	8	9	10	11	12	13	14	? 16
<i>Senecio viscosus</i> , 51	-	-	3	4	-	6	7	8	-	-	11	12	13	14	15 16
<i>Glyceria rigida</i>	1	2	3	4	5	6	7	8	9	10	11	-	-	14	15 - 17
<i>Parietaria officinalis</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15 - 17
<i>Sisymbrium Sophia</i>	1	2	3	4	5	6	7	8	9	10	11	-	13	14	15 - 17
<i>Scandix Pecten</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15 - 17
<i>Hypericum hirsutum</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15 - 17
<i>Arenaria trinervis</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15 - 17
<i>Poa compressa</i>	1	2	3	4	5	6	7	8	-	10	11	12	13	14	15 - 17
<i>Briza media</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15 - 17
<i>Potentilla Fragariast.</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15 - 17
<i>Helianthem. vulgare</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15 - 17
<i>Genista anglica</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15 - 17
<i>Adoxa moschatellina</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15 - 17
<i>Astragalus glycyphyl.</i>	1	2	3	4	5	-	7	8	-	10	11	12	13	14	15 - 17
<i>Hypericum Androsæ.</i>	1	2	3	4	5	6	7	-	9	10	11	12	13	-	15 16 17
<i>Carex paludosa</i>	1	2	3	4	5	6	7	8	9	10	11	-	13	14	15 16 17



<i>Lycopod. inundatum</i>	1	2	3	4	5	-	-	8	9	10	-	12	-	-	15	16	17	
<i>Avena pratensis</i>	1	2	3	4	5	-	7	8	9	10	11	12	13	14	15	16	17	
<i>Asperugo procum.</i> , 52	-	-	-	-	5	-	-	-	-	-	11	-	-	14	-	-	17	
<i>Papaver Argemone</i>	1	2	3	4	5	6	7	8	9	10	11	12	-	14	15	16	17	18
<i>Carex vulpina</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	-	18

9. *Southward of 59 lat. Temp. 46 fahr. 7.6 cent.*

<i>Saxifraga tridactylites</i>	1	2	3	4	5	6	7	8	9	10	11	12	-	14	15	-	17	
<i>Tragopogon pratensis</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	-	17	
<i>Eriophorum latifolium</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	-	17	
<i>Atriplex arenaria</i>	1	2	3	-	-	-	-	-	9	10	-	-	13	-	-	16	17	
<i>Cladium Mariscus</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	-	-	-	17	
<i>Pyrus Aria, etc.</i>	1	2	3	4	5	6	7	8	-	10	11	12	-	-	-	16	17	
<i>Malaxis paludosa</i>	1	2	3	4	-	-	-	-	9	-	11	12	13	-	15	16	17	
<i>Epipactis ovalis</i> , 52	-	-	-	4	5	-	7	-	-	10	-	12	-	-	-	-	17	
<i>Galium cruciatum</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	-	-	18
<i>Epilobium parviflorum</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	-	18
<i>Ulmus montana</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	-	17	18
<i>Cardamine sylvatica</i>	1	2	3	4	5	6	-	8	9	10	11	12	13	14	15	16	-	18
<i>Callitriche peduncul.</i>	1	2	3	-	5	6	7	8	9	10	11	12	13	14	15	16	17	18
<i>Myosotis repens</i>	1	2	3	4	5	6	-	-	9	10	11	12	13	14	15	16	17	18

10. *Northward to Orkney. Temp. (say) 46 fahr. 7.5 cent.*

<i>Thlaspi arvense</i>	1	2	3	4	5	6	-	8	9	10	11	12	13	14	15	16	17	18
<i>Stachys ambigua</i>	1	-	3	4	-	-	-	-	-	-	11	12	-	-	15	-	-	18
<i>Hypericum Elodes</i>	1	2	3	4	5	6	7	8	9	10	-	12	13	-	-	16	-	18
<i>Pinguicula lusitanica</i>	1	2	-	-	-	-	-	-	-	-	-	12	-	-	-	16	17	18
<i>Lastræa Fœnisecii</i>	1	2	3	-	5	6	7	-	-	10	-	12	-	-	-	16	-	18
<i>Asplenium marinum</i>	1	2	-	-	-	6	7	-	9	10	11	12	13	14	15	16	17	18
<i>Pyrethrum maritim.</i>	1	2	-	-	-	6	7	-	9	10	11	12	13	14	15	16	-	18
<i>Carex extensa</i>	1	2	3	4	-	6	7	-	9	10	11	12	13	14	15	16	-	18
<i>Carex distans</i>	1	2	3	4	5	6	7	-	9	10	11	-	13	14	15	16	17	18
<i>Carex paniculata</i>	1	2	3	4	5	6	7	8	9	10	11	-	13	14	15	16	17	18
<i>Scirpus fluitans</i>	1	2	3	4	5	-	7	8	9	10	11	12	13	14	15	16	17	18
<i>Zannichellia palustris</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	-	-	17	18
<i>Potamogeton pusillus</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	-	18
<i>Potamogeton perfoliat.</i>	1	2	3	4	5	-	7	8	9	10	11	12	13	14	15	16	17	18
<i>Primula veris</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	-	17	18
<i>Epilobium tetragonum</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	-	18
<i>Potamogeton filiformis</i>	-	2	-	4	-	-	7	8	9	10	11	-	-	14	15	-	17	18

11. *Northward to Shetland. Temp. 45½—45 fahr. 7·3—7 cent.*

<i>Erythræa littoralis</i>	1	2	-	4	-	6	7	-	9	-	11	12	13	14	15	16	-	18
<i>Juncus compressus</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	-	18
<i>Sagina maritima</i>	1	2	-	4	-	6	7	-	9	10	11	12	13	14	15	16	17	18
<i>Ruppia maritima</i>	1	2	3	4	-	6	7	-	9	10	11	12	13	14	15	16	-	18
<i>Polygonum Raii</i>	1	2	-	4	-	6	7	8	9	-	-	12	13	14	15	16	-	18
<i>Beta maritima</i>	1	2	3	4	5	6	7	-	-	10	-	12	-	14	15	16	-	18
<i>Eryngium maritimum</i>	1	2	3	4	-	6	7	8	9	10	-	12	13	14	15	16	-	18
<i>Cerastium tetrandrum</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	-	18
<i>Jasione montana</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	-	15	16	-	18
<i>Osmunda regalis</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	-	15	16	17	18
<i>Scolopendr. vulgare</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	-	18
<i>Lamium incisum</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	-	18
<i>Sonchus asper</i>	1	2	3	4	5	6	7	8	-	10	11	12	13	14	15	16	-	18
<i>Anthriscus vulgaris</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	-	17	18
<i>Avena fatua</i>	1	2	3	4	5	6	7	8	9	10	11	-	-	14	15	-	-	18
<i>Sedum anglicum</i>	1	2	3	4	5	6	7	-	-	10	11	12	13	-	15	16	-	18
<i>Gymnadenia Conopsea</i>	1	2	3	4	5	-	7	8	9	10	11	12	13	14	15	16	17	18
<i>Callitriche platycarpa</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	-	18
<i>Carex Œderi</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	-	18
<i>Carex præcox</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	-	-	18
<i>Rhynchospora alba</i>	1	2	3	4	5	6	7	-	9	10	11	12	13	-	15	16	17	18
<i>Utricularia vulgaris</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	-	17	18
<i>Potamog. heterophyl.</i>	?	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	-	18
<i>Myosotis collina</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	-	-	18
<i>Hypericum perforat.</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	-	17	18
<i>Anagallis tenella</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	-	18
<i>Scilla verna</i>	1	-	-	-	-	6	7	-	-	-	11	12	13	14	15	16	17	18
<i>Atriplex angustifolia</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	-	18
<i>Rumex conglomerat.</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	-	-	18
<i>Polygonum Hydrop.</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	-	18
<i>Zostera marina</i>	1	2	3	4	-	6	7	-	9	10	11	12	13	14	15	16	17	18
<i>Glyceria maritima</i>	1	2	3	4	5	6	7	-	9	10	11	-	13	14	15	16	17	18
<i>Cakile maritima</i>	1	2	3	4	-	6	7	8	9	10	11	12	13	14	15	16	17	18
<i>Silene maritima</i>	1	2	3	4	5	6	7	-	9	10	11	12	13	14	15	16	17	18
<i>Carex arenaria</i>	1	2	3	4	-	6	7	8	9	10	11	12	13	14	15	16	17	18
<i>Cochlearia danica</i>	1	2	3	4	-	6	7	-	9	-	11	12	-	14	15	16	-	18
<i>Catabrosa aquatica</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	-	18

Potamogeton pectinat.	1	2	3	4	5	-	7	8	9	10	11	-	13	14	15	-	-	18
Ophioglos. vulgatum	1	2	3	4	5	-	7	8	9	10	11	12	13	14	15	16	-	18
Festuca "elatior"	1	2	3	4	5	-	7	8	9	10	11	12	13	14	15	16	-	18
Gentiana Amarella	1	2	3	4	5	6	7	8	9	10	11	12	-	14	15	16	17	18
Hippuris vulgaris	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	-	18
Honckeneja peploid.	1	2	3	4	-	6	7	8	9	10	11	12	13	14	15	16	17	18
Lathyrus maritimus	-	2	3	4	-	-	-	8	-	-	-	-	-	-	-	-	-	18

## II. GENERAL SPECIES, MORE OR LESS AUSTRAL.

### 1. Between 50—58 lat. Provinces all, except 17, 18.

Nasturtium terrestre. Equisetum Telmateia. Nuphar lutea.  
 Hieracium boreale. Potentilla reptans. Lysimachia vulgaris.  
 Arundo Epigejos. Cichorium Intybus. Samolus Valerandi.  
 Bidens cernua. Carlina vulgaris. Origanum vulgare.  
 Lolium temulentum. Carduus acanthoides. Lotus major.  
 Ornithopus perpusillus. Veronica montana. Linaria vulgaris.  
 Bromus asper. Bromus sterilis. Bromus giganteus.  
 Scirpus sylvaticus. Malva moschata. Anagallis arvensis.  
 Petasites vulgaris. Salsola Kali. Ranunculus bulbosus.  
 Hypericum humifusum. Agrimonia Eupatoria. Torilis Anthriscus.  
 Rumex sanguineus. Cœnanthe crocata. Sparganium simplex.  
 Carex vesicaria. Carex muricata. Potamogeton crispus.  
 Carex hirta. Carex curta. Geranium pratense.  
 Poa nemoralis. Lepidium Smithii. Prunus avium.  
 Salix viminalis. Salix alba. Bromus commutatus.  
 Salix caprea. Polygonum lapathifolium. Ægopodium Podagraria.  
 Phleum pratense, possibly native also in 17 and 18.

### 2. Between 50—58 lat. Provinces all, except 18.

Vicia lathyroides. Scirpus maritimus. Triticum caninum.  
 Corydalis claviculata. Chenopodium B. Henricus. Bromus secalinus.  
 Lithospermum officinale. Carex remota. Geranium lucidum.  
 Filago germanica. Lychnis vespertina. Spergularia rubra.  
 Trifolium filiforme. Viburnum Opulus. Fraxinus excelsior.  
 Medicago lupulina. Alisma ranunculoides. Trifolium arvense.  
 Allium ursinum. Lychnis Githago. Silene inflata.  
 Reseda Luteola. Erysimum Alliaria. Geum urbanum.  
 Chærophyllum temulentum. Festuca bromoides. Polystichum lobatum.



*Malva sylvestris*. *Solanum Dulcamara*. *Sherardia arvensis*.  
*Hypericum quadrangulum*. *Glechoma hederacea*. *Lycopus europæus*.  
*Alisma Plantago*. *Pyrethrum Parthenium*, not native, scarce wild to 58.

3. *Between 50—59 lat. Provinces all, except 18.*

*Potamogeton rufescens*. *Scirpus pauciflorus*. *Pilularia globulifera*.  
*Carex pallescens*. *Filago minima*. *Myrica Gale*.  
*Rosa spinosissima*. *Arabis hirsuta*. *Euphorbia Peplus*.  
*Circæa Lutetiana*. *Kœleria cristata*. *Listera ovata*.  
*Ilex Aquifolium*. *Scleranthus annuus*. *Sanicula europæa*.  
*Habenaria bifolia*. *Vicia hirsuta*. *Eupatorium cannabinum*.  
*Knautia arvensis*. *Cratægus Oxyacantha*. *Prunus spinosa*.  
*Anemone nemorosa*. *Pimpinella Saxifraga*. *Lysimachia nemorum*.  
*Geranium dissectum*. *Ononis arvensis*. *Spartium scoparium*.  
*Quercus Robur*. *Ulex europæus*. (Both doubtful natives in 58—59.)

4. *Latitude 50—59. Provinces all. To Hebrides.*

*Myriophyllum alterniflorum*. *Utricularia minor*. *Aster Tripolium*.  
*Lithospermum arvense*. *Echium vulgare*. *Carex pilulifera*.  
*Hyacinthus non-scriptus*. *Crepis virens*. *Asplenium Ruta-muraria*.  
*Hieracium vulgatum*. *Scutellaria galericulata*. *Senecio sylvaticus*.  
*Ranunculus sceleratus*. *Ranunculus hederaceus*. *Erodium cicutarium*.  
*Alnus glutinosa*. *Tanacetum vulgare*, scarcely wild so far north.

5. *Latitude 50—60. Provinces all. To Orkney.*

*Festuca rubra* (?) *Potamogeton oblongus*. *Cystopteris fragilis*.  
*Scirpus multicaulis*. *Radiola Millegrana*. *Alchemilla vulgaris*.  
*Lycopodium clavatum*. *Avena pubescens*. *Arabis thaliana*.  
*Myriophyllum spicatum*. *Populus tremula*. *Viola palustris*.  
*Geum rivale*. *Festuca pratensis*. *Rubus Idæus*.  
*Helosciadium inundatum*. *Fedia olitoria*. *Sagina nodosa*.  
*Gnaphalium sylvaticum*. *Mentha arvensis*. *Lemna minor*.  
*Mentha aquatica*. *Trifolium medium*. *Stachys arvensis*.  
*Lamium amplexicaule*. *Veronica scutellata*. *Fumaria capreolata*.  
*Sparganium ramosum*. *Brachypodium sylvaticum*. *Draba verna*.  
*Chrysosplenium oppositifolium*. *Stellaria Holostea*. *Mercurialis perennis*.  
*Trifolium procumbens*. *Peplis Portula*. *Scirpus setaceus*.  
*Bunium flexuosum*. *Montia fontana*. *Betula alba*.  
*Teucrium Scorodonia*. *Alchemilla arvensis*. *Nasturtium officinale*.



*Ranunculus aquatilis*. *Scrophularia nodosa*. *Geranium Robertianum*.  
*Carex stellulata*. *Asplenium Trichomanes*. *Melampyrum pratense*.  
*Lastrea dilatata*. *Arenaria serpyllifolia*. *Oxalis Acetosella*.  
*Sedum acre*. *Veronica agrestis*. *Conium maculatum*.  
*Valeriana officinalis*. *Polygonum Convolvulus*. *Sisymbrium officinale*.  
*Rumex obtusifolius*. *Asplenium A. nigrum*. *Digitalis purpurea*.  
*Bartsia Odontites*. *Vicia sepium*. *Lapsana communis*.  
*Hieracium Pilosella*. *Polygala vulgaris*. *Corylus Avellana*.  
*Galium Aparine*. *Hypochæris radicata*. *Lotus corniculatus*.  
*Vicia sativa*, probably much spread by cultivation.

6. *Latitude 50—61. Provinces all. To Shetland.*

1. *Sub-equal, or predominating in the South :—*

*Schoberia maritima*. *Cochlearia officinalis*. *Juniperus communis*.  
*Salicornia herbacea*. *Ammophila arundinacea*. *Atriplex Babingtonii*.  
*Agrostis "canina."* *Triticum "juncum."* *Spergularia marina*.  
*Nymphæa alba*. *Triglochin maritimum*. *Littorella lacustris*.  
*Armeria maritima*. *Centaurea Cyanus*. *Festuca duriuscula*.  
*Orchis mascula*. *Gnaphalium uliginosum*. *Glaux maritima*.  
*Luzula multiflora*. *Plantago maritima*. *Scirpus lacustris*.  
*Salix cinerea*, etc. *Myosotis versicolor*. *Holcus mollis*.  
*Carex ovalis*. *Veronica hederifolia*. *Orobis tuberosus*.  
*Ranunculus Ficaria*. *Ajuga reptans*. *Salix aurita*.  
*Myosotis cæspitosa*. *Salix repens*, etc. *Carex binervis*.  
*Atriplex hastata*. *Asperula odorata*. *Carex pulicaris*.  
*Juncus supinus*. *Botrychium Lunaria*. *Luzula pilosa*.  
*Scirpus palustris*. *Carex "flava."* *Lastrea Oreopteris*.  
*Alopecurus pratensis*. *Cardamine hirsuta*. *Carex panicea*.  
*Juncus acutiflorus*. *Anthriscus sylvestris*. *Carex glauca*.  
*Erythræa Centaurium*. *Fumaria officinalis*. *Fragaria vesca*.  
*Rosa canina*, etc. *Stellaria graminea*. *Sonchus oleraceus*.  
*Nardus stricta*. *Aira flexuosa*. *Aira caryophyllea*.  
*Orchis latifolia*. *Triodia decumbens*. *Tussilago Farfara*.  
*Luzula sylvatica*. *Drosera rotundifolia*. *Molinia cærulea*.  
*Hydrocotyle vulgaris*. *Arundo Phragmites*. *Sonchus arvensis*.  
*Alopecurus geniculatus*. *Juncus conglomeratus*. *Solidago Virgaurea*.  
*Callitriche "verna."* *Daucus Carota*. *Polygonum Persicaria*.  
*Chrysanthemum Leucanthemum*. *Phalaris arund.* *Orchis maculata*.  
*Hedera Helix*. *Lonicera Periclymenum*. *Apargia autumnalis*.

*Veronica Chamædrys.* *Campanula rotundifolia.* *Juncus effusus.*  
*Hieracium* "murorum," perhaps including several species.

2. *Predominating in the North :—*

Taraxacum palustre. Epilobium angustifolium. Carex speirostachya.  
Eriophorum vaginatum. Schœnus nigricans. Lycopodium Selago.  
Habenaria viridis. Pinguicula vulgaris. Gentiana campestris.  
Vaccinium Myrtillus. Scirpus cæspitosus. Rosa mollis, etc.  
Equisetum sylvaticum. Comarum palustre. Narthecium.  
Pyrus Aucuparia. Juncus squarrosus. Carex ampullacea.

7. *Latitude 50—61. Provinces all. Sub-provinces all.*

*Ranunculus Flammula* to *Veronica Anagallis*; — being the 120 species enumerated by name on pages 234 to 237, as found in all the 38 sub-provinces. *Potamogeton natans* may likely prove an exception to this generality of distribution; the name being often misapplied to examples of *P. oblongus*.

### III. BOREAL AND MONTANE SPECIES.

Hutchinsia petraea	1 - - - 5 6 7 8 - 10
Draba muralis	1 - - - 5 - 7 8 - 10 - 12
Meconopsis cambrica	1 - - - - 6 7 - - 10 - 12
Sanguisorbia officin.	1 2 3 4 5 6 7 8 9 10 11 12 13 14
Andromeda polifolia	1 - - 4 5 6 7 8 9 10 11 12 13 - 15
Potentilla verna	1 - - 4 5 6 7 8 9 10 11 12 - 14 15
Asplenium septentrio.	1 - - - - 7 - - - 11 12 - 14 15
Chrysosplen. alternif.	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Vicia sylvatica	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
Vaccinium Oxycoccus	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 - 17
Utricularia intermedia	1 2 - - - - - - - 11 12 - - 15 - 17
Geranium sanguineu.	1 - 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
Carex filiformis	1 - - 4 5 - 7 8 9 10 11 12 13 14 15 16 17
Arenaria verna	1 - - - - 6 7 8 9 10 11 12 13 14 15 - 17
Equisetum variegatum	1 - - - - - - - 9 10 11 12 13 14 15 16 17
Orobanche rubra	1 - - - - - - - 10 - - - - - 16 17
Sagina subulata	1 2 3 - - 6 7 - 9 - - 12 13 14 15 16 17 18
Elymus arenarius	1 2 - 4 - - 7 8 - 10 11 - 13 - 15 - 17 18
Polypodium Phegopt.	1 2 - - 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Listera cordata	1 2 - - 5 - 7 8 9 10 11 12 13 14 15 16 17 18
Thalictrum minus	1 - 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

<i>Gnaphalium dioicum</i>	1	-	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
<i>Empetrum nigrum</i>	1	-	-	-	5	6	7	8	9	10	11	12	13	14	15	16	17	18
<i>Allosorus crispus</i>	1	-	-	-	5	6	7	8	9	10	11	12	13	14	15	16	17	18
<i>Hymenophyl. Wilsoni</i>	1	-	-	-	5	6	7	-	9	10	-	12	13	14	15	16	17	18
<i>Saxifraga hypnoides</i>	1	-	-	-	5	-	7	8	-	10	11	12	13	14	15	16	17	18
<i>Galium pusillum</i>	1	-	-	-	5	-	-	8	-	10	11	12	-	14	15	-	-	18
<i>Lycopodium alpinum</i>	1	-	-	-	-	6	7	8	9	10	11	12	13	14	15	16	17	18

<i>Asarum europæum.</i>	2	3	-	-	-	-	-	9	10	-	12							
<i>Myosotis sylvatica</i>	2	3	4	5	-	7	8	9	10	11	12	13	14	15				
<i>Festuca sylvatica</i>	2	-	-	5	-	-	-	-	10	11	12	-	14	15				
<i>Pyrola minor</i>	2	3	4	5	6	7	8	-	10	11	12	13	14	15	16	17		
<i>Galeopsis versicolor</i>	2	3	4	5	-	7	8	9	10	11	12	13	14	15	16	17		
<i>Carex dioica</i> (1 ?)	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
<i>Parnassia palustris</i>	2	3	4	5	-	7	8	9	10	11	12	13	14	15	16	17	18	
<i>Salix ambigua</i>	2	-	4	-	-	-	-	-	-	-	-	-	-	15	16	17	18	
<i>Pyrola media</i>	2	-	-	5	-	-	-	-	10	11	12	13	14	15	16	17	18	
<i>Habenaria albida</i>	2	-	-	-	6	7	-	9	10	11	12	13	-	15	16	17	18	
<i>Scirpus uniglumis</i>	2	-	-	-	-	-	-	9	-	11	-	-	14	15	16	-	18	

<i>Cardamine impatiens</i>	3	-	5	6	7	8	-	10										
<i>Pyrola rotundifolia</i>	3	4	5	-	-	-	9	10	11	-	-	14	15					
<i>Campanula latifolia</i>	3	4	5	6	7	8	9	10	11	12	13	14	15	16				
<i>Equisetum hyemale</i>	3	4	5	-	7	8	9	10	11	12	13	14	15	-	17			
<i>Astragalus Hypoglot.</i>	3	4	5	-	-	8	-	10	11	-	-	14	15	-	17			
<i>Sparganium natans</i>	3	-	-	-	7	-	-	-	11	-	13	-	15	16	-	18		

<i>Carex limosa</i>	4	5	6	7	-	9	10	11	12	13	14	15	16					
<i>Symphytum tuberos.</i>	4	-	-	-	-	-	10	-	-	-	13	14	15	16				
<i>Sparganium minimum</i>	4	5	-	-	-	-	10	-	-	-	13	-	15	-	17			
<i>Drosera anglica</i>	4	5	6	-	8	-	10	11	12	13	-	15	16	17	18			

<i>Polemonium cæruleum</i>	5	-	-	8	-	10	11	12										
<i>Alisma natans</i>	5	6	7	-	-	10	-	-	13									
<i>Ribes alpinum</i>	5	6	7	8	9	10	11	12	13	14								
<i>Scheuchzeria palustris</i>	5	-	-	8	9	10	-	-	-	-	15							
<i>Salix pentandra</i> (2 ?)	5	6	7	8	9	10	11	12	13	14	15	16						
<i>Stellaria nemorum</i>	5	6	7	8	9	10	11	12	13	14	15	16						
<i>Rubus suberectus</i> (3 ?)	5	-	7	8	-	10	-	12	13	-	15	16						

Prunus Padus (3 ?)	5	6	7	8	9	10	11	12	13	14	15	16	17	
Crepis paludosa	5	6	7	8	9	10	11	12	13	14	15	16	17	
Carduus heterophyllus	5	6	7	8	9	10	11	12	13	14	15	16	17	
Polypod. Dryopteris	5	6	7	8	9	10	11	12	13	14	15	16	17	
Asplenium viride	5	6	7	8	-	10	11	12	13	-	15	16	17	
Geranium sylvaticum	5	-	-	8	9	10	11	12	13	14	15	16	17	
Melica nutans	5	-	-	8	-	10	11	12	13	14	15	16	17	
Viola lutea (1 ?)	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Rubus saxatilis	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Trollius europæus	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Myrrhis odorata	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Vaccinium Vitis-Idæa	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Hieracium pallidum	5	6	7	-	-	10	11	12	13	14	15	16	17	18
Lobelia Dortmanna	5	6	7	-	-	-	-	12	13	-	15	16	17	18
Dryas octopetala	5	-	7	-	-	10	-	-	-	-	15	16	17	18

<i>Helianthemum canum</i>	6	7	-	-	10	-	12							
<i>Lychnis Viscaria</i>	6	7	-	-	-	-	-	13	14	15				
<i>Vicia Orobus</i>	6	7	-	-	-	-	12	13	14	15	16			
<i>Isoetes lacustris</i>	6	7	-	-	-	-	12	-	-	15	16	17		
<i>Galium boreale</i>	6	7	-	-	10	11	12	13	14	15	16	17	18	
<i>Salix herbacea</i>	6	7	-	-	10	11	12	13	-	15	16	17	18	
<i>Saxifraga oppositifolia</i>	6	7	-	-	10	-	12	13	-	15	16	17	18	

<i>Lloydia serotina</i>	7													
<i>Thlaspi alpestre</i> (6?)	7	8	-	10	11	12	-	-	15					
<i>Hieracium gothicum</i>	7	-	-	10	11	-	-	-	15					
<i>Woodsia ilvensis</i> , etc.	7	-	-	-	11	12	13	-	15					
<i>Asplenium germanicum</i>	7	-	-	-	11	12	-	14	15					
<i>Carex atrata</i>	7	-	-	-	-	-	13	-	15					
<i>Hieracium lasiophyllum</i>	7	-	-	-	-	-	-	-	15					
<i>Meum Athamanticum</i>	7	-	-	10	11	12	13	-	15	16				
<i>Poa cæsia</i> , etc.	7	-	-	10	11	-	-	-	15	16				
<i>Carex irrigua</i>	7	-	-	-	11	12	13	-	15	16				
<i>Callitriche autumnalis</i>	7	-	-	-	11	-	-	-	15	16				
<i>Saxifraga nivalis</i>	7	-	-	-	-	12	-	-	15	16				
<i>Rubus Chamæmorus</i>	7	8	9	10	11	12	13	-	15	16	17			
<i>Epilobium alsinifolium</i>	7	-	-	10	11	12	13	-	15	16	17			
<i>Polystichum Lonchitis</i>	7	-	-	10	11	-	-	-	15	16	17			



Carex Persoonii	7	-	-	10	11	-	-	-	15	-	17
Poa alpina	7	-	-	10	-	12	-	-	15	16	17
Veronica humifusa	7	-	-	-	11	12	-	-	15	16	17
Subularia aquatica	7	-	-	-	-	12	13	-	15	16	17
Cerastium alpinum	7	-	-	-	-	12	-	-	15	16	17
Cerastium latifolium	7	-	-	-	-	-	-	-	15	16	17
Lycopodium selaginoides	7	8	9	10	11	12	13	14	15	16	17 18
Draba incana	7	8	-	10	11	12	-	-	15	16	17 18
Lycopodium annotinum	7	8	-	-	-	12	-	-	15	16	17 18
Blysmus rufus	7	-	9	-	11	-	13	14	15	16	17 18
Sedum Rhodiola	7	-	-	10	11	12	13	14	15	16	17 18
Saxifraga stellaris	7	-	-	10	11	12	13	14	15	16	17 18
Thalictrum alpinum	7	-	-	10	11	12	13	-	15	16	17 18
Polygonum viviparum	7	-	-	10	11	12	-	-	15	16	17 18
Juncus triglumis	7	-	-	10	11	12	-	-	15	16	17 18
Juniperus nana	7	-	-	10	11	12	-	-	15	16	17 18
Circæa alpina (vera)	7	-	-	10	-	12	-	-	15	16	17 18
Carex rigida	7	-	-	-	11	12	-	-	15	16	17 18
Hieracium argenteum	7	-	-	-	11	12	-	-	15	-	- 18
Mertensia maritima	7	-	-	-	-	12	13	14	15	16	17 18
Saussurea alpina	7	-	-	-	-	12	13	-	15	16	17 18
Oxyria reniformis	7	-	-	-	-	12	-	-	15	16	17 18
Silene acaulis	7	-	-	-	-	12	-	-	15	16	17 18
Luzula spicata	7	-	-	-	-	12	-	-	15	16	17 18
Arabis petræa	7	-	-	-	-	-	-	-	15	16	17 18
Carum Carui	8	-	10	-	12						
Lysimachia thyrsoiflora	8	-	10	-	-	13	-	15	16		
Arundo stricta	9										
Lastrea rigida	9	10	-	12							
Primula farinosa	9	10	11	12	-	14					
Saxifraga Hirculus	9	10	11	12	13	14	15				
Allium Scorodoprastum	9	10	11	12	13	14	15				
Potentilla alpestris	9	10	11	12	-	-	15				
Salix phylicifolia	9	10	11	12	13	-	15	16	-	18	
Salix acutifolia	10										
Galium montanum	10										

<i>Polygala austriaca</i>	10								
<i>Cypripedium Calceolus</i>	10	11	?						
<i>Potentilla fruticosa</i>	10	11	12						
<i>Gentiana verna</i>	10	11	12						
<i>Actæa spicata</i>	10	-	12						
<i>Thalictrum "majus"</i>	10	11	12	13	14	15			
<i>Salix laurina</i>	10	11	12	-	-	15			
<i>Bartsia alpina</i>	10	11	12	-	-	15			
<i>Elyna caricina</i>	10	11	12	-	-	15			
<i>Hieracium crocatum</i>	10	11	-	-	-	15			
<i>Hieracium prenanthoid.</i>	10	11	-	-	-	15			
<i>Myosotis alpestris</i>	10	-	12	-	-	15			
<i>Equisetum umbrosum</i>	10	11	12	13	14	15	16		
<i>Sedum villosum</i>	10	11	12	13	14	15	16		
<i>Salix nigricans</i>	10	11	12	-	14	15	16		
<i>Crepis succisæfolia</i>	10	11	-	-	14	15	16		
<i>Melampyrum sylvaticum</i>	10	11	12	13	14	15	-	17	
<i>Hieracium rigidum</i>	10	11	12	13	14	15	-	17	
<i>Sesleria cærulea</i>	10	11	12	-	-	15	-	17	
<i>Hieracium iricum</i>	10	11	-	13	-	15	-	17	
<i>Carex capillaris</i>	10	11	-	13	-	15	-	17	
<i>Carex pauciflora</i>	10	11	-	13	-	15	16	17	
<i>Cornus suecica</i>	10	11	-	-	-	15	16	17	
<i>Tofieldia palustris</i>	10	11	-	-	-	15	16	17	
<i>Pyrola secunda</i>	10	-	12	-	-	15	16	17	
<i>Hieracium strictum</i>	10	-	12	-	-	15	16	17	
<i>H. cæsium (imperfect)</i>	10	-	-	-	-	15	-	17	
<i>Rumex aquaticus</i>	10	11	12	13	14	15	16	-	18
<i>Saxifraga aizoides</i>	10	11	12	13	-	15	16	17	18
<i>Trientalis europæa</i>	10	11	12	-	14	15	16	17	18
<i>Arbutus Uva-ursi</i>	10	11	12	-	14	15	16	17	18
<i>Hieracium anglicum</i>	10	11	12	-	-	15	-	-	18
<i>Alchemilla alpina</i>	10	-	12	-	-	15	16	17	18

<i>Arenaria uliginosa</i>	11								
<i>Hieracium corymbosum</i>	11	-	-	-	15				
<i>Convallaria verticillata</i>	11	-	-	-	15				
<i>Orobis niger</i>	11	-	-	-	15				
<i>Betula nana</i>	11	-	-	14	15	16	17		

<i>Linnæa borealis</i>	11	-	-	14	15	-	17
<i>Vaccinium uliginosum</i>	11	12	-	-	15	16	17 18
<i>Ligusticum scoticum</i>	11	-	13	14	15	16	17 18
<i>Salix Lapponum</i>	11	-	-	14	15	16	17 18
<i>Juncus filiformis</i>	12	-	-	15			
<i>Lychnis alpina</i>	12	-	-	15			
<i>Hieracium holosericeum</i>	12	-	-	15	16		
<i>Hieracium chrysanthum</i>	12	-	-	15	16	17	
<i>Corallorhiza innata</i>	13	14	15	-	17		
<i>Oxytropis uralensis</i>	13	-	15	16	17		
<i>Lamium intermedium</i>	13	14	15	16	-	18	
<i>Hieracium denticulatum</i>	14	-	16	(Mr. Borrer's plant.)			
<i>Sibbaldia procumbens</i>	14	15	16	17	18		
<i>Carex incurva</i>	14	15	-	17	18		
<i>Saxifraga cernua</i>	15	Mid Perth.					
<i>Menziesia cærulea</i>	15	do.					
<i>Gentiana nivalis</i>	15	Perth.	Forfar.	Westernness?			
<i>Cystopteris montana</i>	15	do.	do.				
<i>Erigeron alpinus</i>	15	do.	do.	Aberdeen?			
<i>Juncus biglumis</i>	15	Perth.	Forfar.	Aberdeen.			
<i>Phleum alpinum</i>	15	do.	do.	do.			
<i>Hieracium senescens</i>	15	do.	do.	do.			
<i>Oxytropis campestris</i>	15	Forfar.					
<i>Equisetum Mackaii</i>	15	Kincardine or Aberdeen. —?					
<i>Caltha radicans</i>	15	Forfar. Aberdeen.					
<i>Mulgedium alpinum</i>	15	do.	do.				
<i>Astragalus alpinus</i>	15	do.	do.				
<i>Gnaphalium norvegicum</i>	15	do.	do.				
<i>Salix lanata</i>	15	do.	do.				
<i>Carex aquatilis</i>	15	do.	do.				
<i>Carex rariflora</i> (17?)	15	do.	do.				
<i>Carex VahlII</i> (alpina)	15	do.	do.				
<i>Hieracium flocculosum</i>	15	do.	do.				
<i>Hieracium gracilentum</i>	15	do.	do.				
<i>Hieracium calenduliflor.</i>	15	do.	do.				

<i>Hieracium alpinum</i>	15	Forfar.	Aberdeen.
<i>Hieracium aggregatum</i>	15	Aberdeen.	
<i>Hieracium nitidum</i>	15	do.	
<i>Hieracium globosum</i>	15	do.	
<i>Saxifraga cæspitosa</i>	15	do.	Elsewhere?
<i>Carex "lagopina"</i>	15	do.	
<i>Hieracium lingulatum</i>	15 16	Perth. Forf. Aber. Wness.	
<i>Veronica saxatilis</i>	15 16	do. do. Westerness.	
<i>Veronica alpina</i>	15 16	Stirling. P. F. Aber. Wness.	
<i>Saxifraga rivularis</i>	15 16	Perth. Aberdeen. Westerness.	
<i>Stellaria cerastoides</i>	15 16	do. do. Eness. Wness.	
<i>Juncus castaneus</i>	15 16	do. Forf. Aber. Argyle.	
<i>Salix Myrsinites</i>	15 16	do. do. do. do.	
<i>Salix procumbens</i>	15 16	do. Easterness. do.	
<i>Nuphar pumila</i>	15 16	do. Aber. Elgin. Eness. Arg.	
<i>Hieracium nigrescens</i>	15 16	For. Aber. Eness. Wness.	
<i>Hieracium eximium</i>	15 16	do. do. Westerness.	
<i>Poa laxa</i>	15 16	Aberdeen. Westerness.	
<i>Poa minor</i>	15 16	do. do.	
<i>Pinus sylvestris</i>	15 16 17	Now contracted in area.	
<i>Epilobium alpinum</i>	15 16 17	Never seen in Wales.	
<i>Gnaphalium supinum</i>	15 16 17	Clackmannan to Sutherland.	
<i>Carex pulla (saxatilis)</i>	15 16 17	Stirling to Sutherland.	
<i>Goodyera repens</i>	15 16 17	Mid Perth to Ross.	
<i>Pseudathyrium alpestre</i>	15 16 17	do. to Sutherland.	
<i>Juncus trifidus</i>	15 16 17	do. to do.	
<i>Carex vaginata</i>	15 16 17	do. to do.	
<i>Cherleria sedoides</i>	15 16 17	do. to do.	
<i>Draba rupestris</i>	15 - 17	do. to do.	
<i>Arenaria rubella</i>	15 - 17	Perth. Sutherland.	
<i>Salix reticulata</i>	15 - 17	do. For. Aber. Suth.	
<i>Carex rupestris</i>	15 - 17	do. do. do. do.	
<i>Sagina saxatilis</i>	15 - 17	Perth to Sutherland.	
<i>Alopecurus alpinus</i>	15 - 17	Forf. Aber. Eness. Ross.	
<i>Luzula arcuata</i>	15 - 17	Aber. Suthd. Perth?	
<i>Azalea procumbens</i>	15 16 17 18	Stirling to Shetland.	
<i>Salix arbuscula</i>	15 16 ? 18	Perth to Orkney.	
<i>Aira alpina</i>	15 16 17 18	Perth to Hebrides.	



<i>Arbutus alpina</i>	15	16	17	18	Forfar to Shetland.
<i>Pyrola uniflora</i>	15	-	17	18	Perth to Hebrides.
<i>Juncus balticus</i>	15	-	17	18	Forfar to Hebrides.
<i>Eriocaulon septangulare</i>	16				North and Mid Ebudes.
<i>Pinguicula alpina</i>	16	17			North Ebudes. East Ross.
<i>Ajuga pyramidalis</i>	16	17	18		Westernness to Orkney.
<i>Hierochloe borealis</i>	17				Caithness. Forfar?
<i>Primula scotica</i>	17	18			Sutld. Caithness. Orkney.
<i>Cerastium nigrescens</i>	18				Shetland only.
<i>Arenaria norvegica</i>	18		do.	do.	

## IV. EXPLANATIONS OF THE AREAS OF SPECIES.

The three lists placed under the title 'Areas of Species' present an arrangement of the plants which bears a direct relation to the geographical spaces over which they are distributed in this country; with a less direct relation also to their climates, as shown by general temperature, &c. The plants of the antecedent lists are here re-arranged primarily into three leading groups or divisions, thus:—

- A. Austral species, successively ceasing in the northerly direction.
- B. General species, all far extended, though not equally far extended, from south to north.
- C. Boreal and montane species, successively ceasing in the downward and southerly direction,—or, the same thing, successively appearing to the observer who advances northward and upward.

These three divisional groups are broadly distinct only at their non-contiguous extremes. As here placed, they may be deemed to pass gradually into each other. In each of the three divisions certain species are to be found, which might have been placed in a different division with almost equal propriety. Thus, *Vicia sylvatica* (page 305) is represented as found in every province from 1 to 17 inclusively, and might have been placed among the general species so circumstanced (page 302); although its decreased frequency in the more southerly provinces led to its inclusion among the boreal plants. In like manner, *Hutchinsia petraea* (page 305) corresponds with various austral species by its early northern termination; but it is placed in the third division on account

of its being almost restricted to certain hilly portions of northern and western England. Again, *Pinguicula vulgaris* (page 305) falls into the division of general species, and *Parnassia palustris* (page 306) into that of boreal and montane species; and yet no great error would have been committed in exchanging their places, so closely do they resemble in their actual distribution.

*Austral Species.*—These are subdivided into secondary groups in accordance with the degree of northern latitude under which the species respectively cease to be found in an indigenous state, if still found at all, —or, in the case of colonists and denizens, the degree under which they cease to appear as sufficiently established species; much uncertainty unavoidably attaching to this latter condition. Thus, the plants included together under the head-title of “1. Southward of 51” will be understood to occur somewhere or anywhere between the latitudinal lines of 50 and 51, as traced on the map; but they are not satisfactorily ascertained to occur beyond the line of 51 northward. In like manner, those included under the head-title of “2. Southward of 52” must be understood to occur somewhere between the lines of 50 and 52. So on with the rest, up to the latitudinal line of 59. Those which extend also to Orkney or to Shetland constitute the remaining two secondary groups of the first division.

Most of the plants placed in this division are found between the latitudinal lines of 50—51, that is, quite to the south of England; extending thence in a northerly direction as far as indicated by the head-titles of the several groups. Those which have not been satisfactorily ascertained to occur between 50—51, are distinguished from the others by having also their southern line indicated by figures set after their names, that is, the line of latitude, to the northward of which they are first found. Where no such indication is given, the most southerly line is to be understood, that of 50. No fractions of degrees are shown; the data not having been found sufficiently complete and exact, to allow of the individual species being placed in a consecutive series strictly according to latitude carried out to such fractions. Thus, any plant certainly known to the northward of the line of 53, however short a distance above it, is entered in the group “Southward of 54.” Of course, these indications of latitude will not invariably correspond with those given for the same species in former volumes; more advanced knowledge

leading to several alterations, curtailing the range of latitude for some species, extending it for others.

It is somewhat arbitrary to include among the "Austral plants" several of those which are distributed nearly or quite throughout Britain, some of them even to Orkney or Shetland. A practical convenience, presently to be explained, has induced this wide extension of the first division of the list, so as to make it include various species which might otherwise as truly and correctly have been enumerated under the second division, that of "General species." It will be observed that none of the plants in this division, which are entered as reaching beyond the latitudinal line of 57 northward, are noted for all the provinces; some one or more being invariably left blank, as shown by the dots, instead of the figures which denote the several provinces.

The *Temperatures* indicated as part of the head-titles for the groups under this division, are not to be taken as rigidly exact. The temperature given is in each case the assumed sea-level temperature for the corresponding line of latitude, in accordance with the scales before given on pages 156 and 158. It is thus a temperature below which the species of that group are not observed to grow in Britain, if plants found at or near the coast-level only. If occurring much above the coast-level, the lowest temperature in which they grow is of course proportionately lower. The temperature, above which the several plants are not seen to grow, may be considered that of the latitudinal line or degree given for their south limit by the figures set close after their names. If not given,—that is to say, for plants extending southward of latitude 51,—the temperature may be considered to rise 1 degree of Fahrenheit, or 0.6 of centigrade, for half a degree of latitude; being 51 or 52 Fahrenheit, and 10.6 or 11.2 centigrade, accordingly as the plants are found to grow or not to grow further south than  $50\frac{1}{2}$ .

But in thus applying the two scales of Fahrenheit and centigrade, it is to be recollected, the rates of decrease in temperature for increase of latitude, or conversely, were not assumed quite equally. In consequence, the mean temperatures indicated by the two scales for the groups of plants, or for the lines of latitude under which they are placed, are not strictly even and correspondent the one with the other, except at the starting point, under the first heading of "1. Southward of 51 latitude,"—where 50 fahr. and 10 cent. do precisely correspond. It is also to be kept in memory, that among the plants ceasing somewhere between any two lines of latitude,—say, for illustration, between 52-53,—



one plant may occur barely above 52, another barely below 53; and consequently, the assumed temperature for the line of 53 will be nearer correctness for the one plant than for the other.

The *Provinces* within which the species severally have been ascertained to occur, or have been found reported on authority deemed reliable, are indicated by their corresponding numerals. On comparing these numbers with those given for the same species, under the head of "Area" in former volumes, it will be seen that the most distrusted provinces are here usually omitted; some others being also now left out, which were before allowed to pass unchallenged. These omissions are mostly suggested by the alleged localities remaining unconfirmed, and being originally liable to distrust. On the contrary, additions have been made in other instances, through increase of knowledge and of records during the years which have elapsed since the former volumes of this work were written. Such variations from time to time become necessary; since existing knowledge is still highly incomplete, and past records are frequently discovered to be in part erroneous.

In too many instances it is hardly better than optional or arbitrary, up to which of the provinces the species are traced in a northerly direction. The actual northward extension of the denizens and colonists,—the first province in which they ought to be deemed aliens only,—must often be matter of individual opinion, or even of conjecture only, as before remarked. And the artificial or man-aided extension northwardly, of the really native species, must frequently make doubtful their true native limits, whether reckoned by provinces or by lines of latitude. Who can certainly say in which province the *Viola odorata* or *Narcissus Pseudo-Narcissus* ceases to present a native claim or character? Who can in like manner now tell where *Sambucus nigra* or *Ribes rubrum* is truly native, and where denizen or alien only? Casual stragglers and indubitable introductions, from England into Scotland, are too frequently reported as wild natives by the botanists and botanical collectors of the latter country; and the same errors or falsifications are committed with regard to the native plants of one province, when found in another to which they do not naturally appertain. And thus it happens, that the writer of this work still finds much uncertainty in regard to the province or the latitude, where several of the plants would most correctly be deemed to cease.

Under each latitudinal group, the species are enumerated in a series or succession determined by the nos. of the provinces, in connexion with



various other more subordinate considerations. The lower the number of the province in which it last appears, the earlier is the name of the plant entered in the latitudinal group; those which do not occur southward of 51 being postponed to those which have the full range of latitude southward. The provincial extremes being the same for two or more plants, the sequence of their names is determined by other conditions;—by the subprovinces or counties, as numbered on the map and on pages 526 to 528 in volume third;—by the existence of other (though distrusted) records for places more northerly;—by the likelihood of other localities being found, especially in the instances of segregate species, the areas of which have been yet imperfectly ascertained;—by the greater or less probability of the plants being native in the province under view; &c. &c.

The counties or vice-counties are also mentioned in the earlier part of the list, where there are few provinces to be enumerated, and ample space is consequently left in the lines. Where provinces or counties become too numerous the range of longitude is substituted, and shown by means of the five vowels. It is chiefly in the three or four degrees of most southerly latitude, that an indication also of the longitudinal extension becomes desirable. The width of southern England, jointly with the far inland extension of several of the provinces there situate, renders an enumeration of those provinces only a very imperfect key to any longitudinal peculiarities in the areas of the species. But in attempting here to show the longitude somewhat more exactly, it was deemed advisable to avoid a further use of numerical figures; because a repetition of the same nos. or figures, with changed significations, might have proved confusing and troublesome to persons who use this work; besides the further inconvenience of signs added to distinguish between figures relating to longitudes east and west of Greenwich. The five vowels *a e i o u* offer a ready substitute, not difficult to keep in recollection. As the lines of longitude are traced on the map in volume third, they form five longitudinal divisions of two degrees each, bounded westward by the lines 8 6 4 2 0. These divisions are sufficiently numerous and exact for the purpose here in view. Each of these five divisions may be represented by one of the vowels; but the first vowel would be applicable only to the Scilly Isles, and to those islets of North Britain which are situate between 8—6 of longitude. The following positions will explain the spaces which are

to be understood by the vowels ; the nos. being the lines of longitude that bound and divide the spaces :—

West 8 a 6 e 4 i 2 o 0 u 2 East.

As the first vowel is never required for longitudes in South Britain, in the absence of any list of plants for the Scilly Isles, a dot or blank is always interposed between the other vowels and the last of the figures which denote the provinces ; confusion between the figures and letters being thus fortunately prevented.

*General Species.*—The plants of the second divisional list (page 302) differ from those enumerated in the latter portions of the first by one particular only. They are still plants which extend northward beyond the latitudinal line of 57, but which differ from those previously enumerated by having been ascertained to occur continuously in provinces 1 to 16, 1 to 17, or 1 to 18 ; that is, they are found in all the intermediate provinces without exception. Other species which extend northward of 57, and into provinces 16, 17, 18, as the case may be, have the provincial continuity of their distribution interrupted by one or more vacant provinces, as shown in the first divisional list. Many of such vacancies are doubtless only temporary ; arising solely from the incompleteness of present knowledge. Eventually, the filling in of such vacancies will remove various species from the first into the second division. Thus, on page 299 *Briza media* and *Genista anglica* are indicated in provinces 1 to 17, with the single exception or vacancy of 16. If they can be certainly ascertained to occur also in the latter province, as is very probable, the completeness of their provincial continuity will then remove them into the corresponding group of the second or general division. By thus restricting the groups of “general species,” so as to include only those with a non-interrupted provincial distribution actually ascertained, many needless repetitions of the same series of figures are avoided, and the lists of names can be compressed into a third of the space, by placing three on each line ;—the practical convenience before adverted to, on page 314. For the most part, however, these general species do also attenuate more or less northward ; that is, they cease altogether, or become scarcer or less certainly native, beyond latitude 57 or 58, in Orkney or Shetland. Some few of them, on the contrary, approximate in their distribution to the third division, that of boreal plants, by having greater frequency in the north than in the

south ; for instance, *Lycopodium Selago* and *Gentiana campestris* (page 305).

The subdivisions of the list of general species are sufficiently explained by the head-titles of the subordinate groups. Within each of these latter groups, the series or succession of names is determined by the number of sub-provinces ascertained for the several species ; with the exception of the first, in which their comital extension northward is also taken into account. Thus, in the group of plants ascertained in all the provinces, and in latitude 50—59, are the following, with others intermediately placed :—*Filago minima* (31 sub-provinces), *Listera ovata* (33), *Ononis arvensis* (35). And among the plants which extend to Orkney, the following succession occurs :—*Mentha aquatica* (34), *Veronica scutellata* (35), *Peplis Portula* (36), *Arenaria serpyllifolia* (37).

*Boreal and Montane Species.*—The third divisional list (page 305) may be considered the reverse of the first ; the plants therein included attenuating, or successively decreasing and ceasing, in a direction from north to south. Or, virtually the same fact, they are species which are scarce or unknown in the low southern provinces of England ; first appearing, or else increasing in frequency, as an observer of them advances from those provinces into others more northerly or more mountainous. The tendency of many of these plants to a northerly prevalence, including several of those which are quite restricted to the comparatively northern latitudes, is closely connected with the mountainous and moorish character of the surface there, and less directly with the latitude of itself. Many do not occur at all to the northward of the Grampian Mountains, situate between latitudes 56—58 ; while some of them are so little boreal, with respect to total Britain, as to be exclusively limited to Mid Britain ; one even to South Britain. But these English plants are still taken along with the boreal plants, because they are found only or chiefly about the mountains ; associated with others which severally extend more and more to the northward, and in such a gradual manner as to render impracticable any decided line of distinction between the boreal and montane plants. Thus it happens that the *Lloydia serotina*, of Carnarvonshire, is classed with the montane and boreal plants, because found only at a considerable elevation ; while the *Cotoneaster vulgaris*, of the same county, was enumerated among the austral plants, because found there only on the coast rocks, at a slight elevation compared with that of the former plant. So,



likewise, the *Gentiana verna* is deemed a boreal plant though unknown in Scotland; being limited to a few northern provinces of England, and affecting their hilly portions chiefly or exclusively.

Head-titles have been deemed unnecessary for the subdivisions of this third list into subordinate groups. They are obviously made in accordance with the number of the most southerly province, or that in which the plants are supposed to find their south limit. The figures for the still more southern provinces are of course omitted; and the needless repetition of dots instead is obviated by commencing the lines with the higher figures or numbers. Counties are mentioned towards the end of this list, as was done at the commencement of the austral list.

This arrangement of the plants according to their latitudinal and provincial areas has proved a difficult and time-consuming task to work out. It is not here presented as one altogether satisfactory or finished; but is rather to be viewed as an inchoate attempt, to be rendered more complete and correct with the future progress of knowledge. The result is in effect a successive elimination from the total flora of Britain, first, of all those species which apparently are unadapted to the more northerly climates. From these the transition is gradually made to those which are adapted to bear the whole climate of Britain, at least near the coast-level; being naturally distributed from one end of the island to the other, more or less thoroughly and completely. And thirdly, come those which appear most adapted to the northern climate, least adapted to the southern climate.

It seems almost needless to explain, that the climatal adaptations here suggested are simply inferences from the actual distribution of the plants; it being of course only this latter that is directly shown and established by tracing the plants through provincial areas and latitudinal ranges. But those botanists who may desire to know the leading facts of species-distribution in this island, and are yet little acquainted with that distribution, will readily acquire a considerable amount of knowledge on this subject, by an occasional glance over the series of names in this Section. It must be assumed that they are already familiar with the plants enumerated by name. In addition, they will require to learn the eighteen provinces by their names and numbers, and their respective positions in the map. This familiarity with the numbers and positions duly attained, the horizontal distribution of any species is seen at a glance by the line of figures; attention being at the same time



drawn to its apparent absence from any considerable portion of the surface by the substitution of dots in place of figures. If that seeming absence should arise only from incompleteness of knowledge, the blank is suggestive of a *desideratum* in topographical botany; namely, a record of some locality, sufficient to supply the want, and fill in the vacuity.

Botanists are fond of recording localities which they find in their tours; but too usually they do so without any knowledge whether they are recording over again facts already well known, and thus making only worthless records,—or, whether they are recording facts which were truly worthy of record, because new and desiderated towards the progress of science. Unreasoning egotism prompts a shallow man to record in print things which are new and interesting to himself; and so, sillily, presumed to be new and interesting to others. Yet the very same man might often do real service to the progress of science, by first ascertaining which of his facts are novel, and are needed to supply some blank or vacancy in its printed records. There is still ample room and opportunity for the services of every botanist; without their energies being wasted in making egotistic repetitions, subserving no beneficial object in science. Rapid, indeed, might have been the progress of British botany during the last quarter-century of cheap and rapid locomotion, if there had been a journal devoted to such an object, and placed under the editorship of a botanist competent to explain to its contributors, from year to year, what sort of facts were wanting towards the advancement of science, and which of their facts would constitute only worthless records. And valuable, indeed, would have been a journal so conducted, not only by its enhanced present interest, but also as a work of historical reference on the book-shelf. But this paragraph is somewhat digressive, though not unusefully suggestive.

To return to the lists. As they now stand, they include the following numbers of species:—

Austral 755. General 420. Boreal, &c., 250.

But if we deduct from the first, and add to the general list, all those included in the groups numbered 8, 9, 10, 11, which extend southward of 51 and northward of 57, that is, all except one dozen, we shall then make out the numbers thus:—

Truly austral 569. Sub-general 606.

From the general plants we might in turn deduct the 18 species enumerated on page 305, and add them to the boreal group, when the latter is set against the austral group, as augmented to 755. Looking at them

somewhat more in detail, we trace out the latitudinal limits of the austral and general plants to these numbers:—

Ceasing in 50—51 latitude, 27 species.

51—52	„	52	„
52—53	„	99	„
53—54	„	65	„
54—55	„	146	„
55—56	„	88	„
56—57	„	104	„
57—58	„	99 plus 49 and 35.	
58—59	„	14 „ 29 „ 17.	
Orkney		17 „ 70 „ —	
Shetland		44 „ 100 „ 120.	

Tracing the plants through the provinces in the order of their corresponding nos., we find the austral and general species ceasing northward, and the boreal and montane species ceasing southward, in the following numbers:—

1. Peninsula	19 northward, 28 southward.
2. Channel	18 „ 11 „
3. Thames	19 „ 6 „
4. Ouse	50 „ 4 „
5. Severn	38 „ 22 „
6. South Wales	22 „ 7 „
7. North Wales	32 „ 40 „
8. Trent	24 „ 2 „
9. Mersey	7 „ 7 „
10. Humber	67 „ 35 „
11. Tyne	45 „ 9 „
12. Lakes	50 „ 4 „
13. W. Lowlands	32 „ 3 „
14. E. Lowlands	38 „ 3 „
15. E. Highlands	133 „ 62 „
16. W. Highlands	115 „ 3 „
17. N. Highlands	90 „ 2 „
18. N. Isles	376 „ 2 „

And distributing the numbers for the province of the North Isles, among the three groups, the 376 species successively reaching or ceasing in them run thus:—

Hebrides 25. Orkney 87. Shetland 264.

If our view were extended, so as to include Faroe and Iceland, a large portion of the Shetland species would still be found in those sub-arctic islands ; as also some others which have not been seen in Shetland, and which thus apparently cease in less northern latitudes while the view takes in the British islands only, apart from other countries.

Some years ago, the writer of this volume would have found similar lists for other countries of Europe exceedingly useful, as aids in his own earlier examinations into plant-distribution beyond the limits of Britain. Indeed, he would still greet any such lists for Scandinavia or Middle Europe with the greatest satisfaction. That which he has himself much felt the want of, in regard to the botany of other countries, he may reasonably believe, will sooner or later be wanted by foreign phyto-geographers, in regard to the botany of Britain. The list of areas now under consideration, equally with some other lists in this volume, has been framed for general as well as for local applications. It is designed for the use of foreigners, as well as for the use of home botanists. But for some of the uses to which the list is applicable, foreigners may require none of the particulars about provinces, counties, &c. Looked at in detail, these are areas within areas, smaller within larger. The single space or whole area, over which any species is extended in Britain, may usually be ascertained for general purposes by the lines of latitude alone ; those for longitude being added also where most needful. By observing this facility, foreigners may use the two first divisions of the list, including five-sixths of the species, with little or no attention to the provincial nos. which are set after the names of the plants.

## VIII. ALTITUDE OF SPECIES.

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### I. UPPER LIMITS ON THE GRAMPIAN MOUNTAINS.

(Counties of Perth, Forfar, Aberdeen, Inverness).

<i>Salix herbacea</i>	32.60 fahr.	1.00 cent.	1440 1360 1310
<i>Saxifraga stellaris</i>	"	"	1440 1360 1310
<i>Lycopodium Selago</i>	"	"	1440 1330 1300
<i>Silene acaulis</i>	"	"	1440 1310 1270
<i>Carex rigida</i>	"	"	1440 1310 1270
<i>Festuca ovina</i>	"	"	1440 1310 1270
<i>Luzula spicata</i>	"	"	1440 1310 1270
<i>Luzula arcuata</i>	"	"	1440 yards.
<i>Gnaphalium supinum</i>	32.70 fahr.	1.05 cent.	1430 1360 1310
<i>Juncus trifidus</i>	32.90 fahr.	1.15 cent.	1410 1260 1200
<i>Vaccinium Myrtillus</i>	33.00 fahr.	1.20 cent.	1400 1310 1250
<i>Hieracium globosum</i>	"	"	" 1400 " B.
<i>Arabis petræa</i>	33.10 fahr.	1.25 cent.	" 1390 " 1200
<i>Aira alpina</i>	33.20 fahr.	1.30 cent.	1380 1360 1230
<i>Rumex Acetosa</i>	33.40 fahr.	1.40 cent.	1360 1310 1260
<i>Taraxacum palustre</i>	"	"	1360 1310 1200
<i>Viola palustris</i>	"	"	1360 1300 1260
<i>Sibbaldia procumbens</i>	"	"	1360 1260 1180
<i>Empetrum nigrum</i>	33.50 fahr.	1.45 cent.	1350 1170 1130
<i>Alchemilla alpina</i>	33.70 fahr.	1.55 cent.	1330 1310 1310
<i>Oxyria reniformis</i>	"	"	1330 1300 1250
<i>Hieracium alpinum</i>	"	"	" 1330 " B.
<i>Hieracium calenduliflorum</i>	"	"	" 1330 " B.
<i>Hieracium gracilentum</i>	"	"	" 1330 " B.
<i>Poa alpina</i>	33.90 fahr.	1.65 cent.	1310 1260 1180
<i>Polygonum viviparum</i>	"	"	1310 1080 1050



<i>Cerastium alpinum</i>	33.90 fahr.	1.65 cent.	1310 1080 1000
<i>Cherleria sedoides</i>	"	"	1310 1080 1000
<i>Saxifraga nivalis</i>	"	"	1310 1080 1000
<i>Saxifraga oppositifolia</i>	"	"	1310 1080 1000
<i>Achillea Millefolium</i>	"	"	1310 1080 880
<i>Saussurea alpina</i>	"	"	1310 1000 900
<i>Cochlearia officinalis</i>	34.00 fahr.	1.70 cent.	1300 1260 1250
<i>Epilobium alpinum</i>	"	"	1300 1230 1230
<i>Sedum Rhodiola</i>	"	"	1300 1210 1210
<i>Ranunculus acris</i>	"	"	1330 1210 1200
<i>Lycopodium alpinum</i>	"	"	1300 1200 1130
<i>Blechnum boreale</i>	"	"	1300 1150 1080
<i>Thalictrum alpinum</i>	"	"	1300 1130 1080
<i>Saxifraga cernua</i>	"	"	1300
<i>Draba rupestris</i>	"	"	1300
<i>Myosotis alpestris</i>	"	"	1300 1160 1000
<i>Arenaria rubella</i>	"	"	" 1300 " 1080
<i>Saxifraga hypnoides</i>	"	"	1300 1080 1000
<i>Oxalis Acetosella</i>	"	"	1300 1080 986
<i>Cystopteris fragilis</i>	"	"	1300 1080 960
<i>Galium saxatile</i>	34.20 fahr.	1.80 cent.	1280 1230 1100
<i>Armeria maritima</i>	34.30 fahr.	1.85 cent.	1270 1200 1080
<i>Stellaria cerastoides</i>	34.40 fahr.	1.90 cent.	1260 1250 1000
<i>Veronica humifusa</i>	"	"	1260 1210 1200
<i>Sagina procumbens</i>	"	"	1260 1080 950
<i>Carex phæostachya</i>	"	"	1260 1020 900
<i>Carex atrata</i>	34.50 fahr.	1.95 cent.	" 1250 " 1000
<i>Aira flexuosa</i>	34.70 fahr.	2.05 cent.	1230 1220 1200
<i>Lastrea dilatata</i>	"	"	1230 1200 1150
<i>Azalea procumbens</i>	"	"	" 1230 " 1180
<i>Veronica alpina</i>	"	"	1230 1000 900
<i>Cerastium latifolium</i>	34.90 fahr.	2.15 cent.	1210 1060 1060
<i>Saxifraga rivularis</i>	"	"	1210 1000
<i>Carex lagopina</i>	"	"	" 1210 "
<i>Saxifraga cæspitosa</i>	35.00 fahr.	2.20 cent.	1200 ?
<i>Cystopteris montana</i>	"	"	1200 ?
<i>Carex Persoonii</i>	"	"	" 1200 "
<i>Poa laxa</i>	"	"	" 1200 "
<i>Poa minor</i>	"	"	" 1200 "

<i>Alchemilla vulgaris</i>	35.00 fahr.	2.20 cent.	1200 1080 1060
<i>Cerastium viscosum</i>	"	"	1200 1080 1060
<i>Euphrasia officinalis</i>	35.20 fahr.	2.30 cent.	1180 1110 1080
<i>Campanula rotundifolia</i>	"	"	1180 1080 1080
<i>Thymus Serpyllum</i>	"	"	1180 1080 980
<i>Caltha palustris</i>	35.40 fahr.	2.40 cent.	1160 1150 1060
<i>Vaccinium uliginosum</i>	"	"	1160 1100 1060
<i>Eriophorum angustifolium</i>	"	"	1160 1060 1050
<i>Hieracium holosericeum</i>	"	"	" 1160 " 1060
<i>Scirpus cæspitosus</i>	"	"	1160 1060 980
<i>Phleum alpinum</i>	"	"	" 1160 " 1100
<i>Alopecurus alpinus</i>	"	"	" 1160 " 1100
<i>Allosorus crispus</i>	"	"	1160 1000 960
<i>Hieracium vulgatum</i>	"	"	" 1160 " 1000
<i>Polypodium Phegopteris</i>	35.50 fahr.	2.45 cent.	1150 910 900
<i>Anthoxanthum odoratum</i>	35.70 fahr.	2.55 cent.	1130 1080
<i>Chrysosplen. oppositifol.</i>	35.90 fahr.	2.65 cent.	1110 1060 1000
<i>Stellaria uliginosa</i>	"	"	1110 1060 1000
<i>Potentilla Tormetilla</i>	"	"	1110 1060 1000
<i>Vaccinium Vitis-idæa</i>	"	"	1110 1080 1066
<i>Carex aquatilis</i>	36.00 fahr.	2.70 cent.	" 1100 " 980
<i>Carex pilulifera</i>	"	"	1100 1080 1030
<i>Calluna vulgaris</i>	"	"	1100 1080 1060
<i>Nardus stricta</i>	"	"	1100 1070 1060
<i>Rubus Chamæmorus</i>	36.20 fahr.	2.80 cent.	1080 1030 1000
<i>Luzula campestris</i>	"	"	1080 1000 960
<i>Poa annua</i>	"	"	1080 1000
<i>Juncus squarrosus</i>	"	"	1080 1000 960
<i>Aspidium Lonchitis</i>	"	"	1080 1000 900
<i>Salix reticulata</i>	"	"	1080 1000 900
<i>Lycopodium selaginoides</i>	"	"	1080 930 910
<i>Adoxa Moschatellina</i>	"	"	1080 Rarely.
<i>Cardamine pratensis</i>	"	"	1080 980 810
<i>Montia fontana</i>	36.40 fahr.	2.90 cent.	1060 1000 980
<i>Narthecium ossifragum</i>	"	"	1060 1000 980
<i>Draba incana</i>	"	"	1060 960 900
<i>Chrysosplenium alternifol.</i>	"	"	1060 900 830
<i>Agrostis vulgaris</i>	"	"	1060 900 800
<i>Silene maritima</i>	"	"	1060 " 720 "

<i>Trollius europæus</i>	36.50 fahr.	2.95 cent.	1050 1000 1000
<i>Saxifraga aizoides</i>	"	"	1050 1000 960
<i>Juncus biglumis</i>	"	"	.....? 1000 950
<i>Carex binervis</i>	36.70 fahr.	3.05 cent.	1030 1010 800
<i>Carex saxatilis</i> (pulla)	"	"	1030 960 830
<i>Melampyrum pratense</i>	"	"	1030 930 900
<i>Luzula sylvatica</i>	"	"	1030 900 900
<i>Orchis maculata</i>	36.90 fahr.	3.15 cent.	1010 960 950
<i>Juncus triglumis</i>	37.00 fahr.	3.20 cent.	1000 980 900
<i>Apargia autumnalis</i>	"	"	1000 960 930
<i>Hieracium nigrescens</i>	"	"	1000 950
<i>Cardamine hirsuta</i>	"	"	1000 900 830
<i>Erigeron alpinus</i>	"	"	1000 ...? 830
<i>Juncus castaneus</i>	"	"	1000 ...? 830
<i>Lychnis alpina</i>	"	"	1000 or "1060"
<i>Hieracium eximium</i>	"	"	"1000" B.
<i>Hieracium chrysanthum</i>	"	"	"1000" B.
<i>Hieracium flocculosum</i>	"	"	"1000" B.
<i>Hieracium murorum</i>	"	"	"1000" B. 900
<i>Carex stellulata</i>	37.10 fahr.	3.25 cent.	990 980 960
<i>Aira cæspitosa</i>	37.20 fahr.	3.30 cent.	980 970 930
<i>Eriophorum vaginatum</i>	"	"	980 950 930
<i>Luzula multiflora</i>	"	"	980 950
<i>Solidago Virgaurea</i>	"	"	980 910 900
<i>Bellis perennis</i>	"	"	980 910 830
<i>Carex vulgaris</i>	"	"	980 900 880
<i>Carex rariflora</i>	"	"	980 900
<i>Viola sylvatica</i>	"	"	980 880 860
<i>Veronica officinalis</i>	"	"	980 730 670
<i>Lastrea Oreopteris</i>	"	"	980 ...? 500
<i>Pinguicula vulgaris</i>	37.40 fahr.	3.40 cent.	960 930 930
<i>Gnaphalium dioicum</i>	"	"	960 930 910
<i>Epilobium alsinifolium</i>	"	"	960 900 900
<i>Carex dioica</i>	"	"	960 900 830
<i>Carex flava</i>	"	"	960 900 800
<i>Triglochin palustre</i>	"	"	960 880 710
<i>Asplenium viride</i>	"	"	960 830 660
<i>Anemone nemorosa</i>	"	"	960 750 700
<i>Cornus suecica</i>	37.50 fahr.	3.45 cent.	950 930 900

<i>Lotus corniculatus</i>	37.50 fabr.	3.45 cent.	950 850 830
<i>Molinia cærulea</i>	"	"	950 850 660
<i>Geum rivale</i>	37.70 fabr.	3.55 cent.	930 930 900
<i>Trientalis europæa</i>	"	"	930 900 810
<i>Arbutus Uva-ursi</i>	"	"	930 860 850
<i>Viola lutea</i>	"	"	930 860 710
<i>Polygala vulgaris</i>	"	"	930 800 760
<i>Galium boreale</i>	"	"	930 730 700
<i>Comarum palustre</i>	"	"	930 710 600
<i>Veronica Beccabunga</i>	"	"	930 700
<i>Trifolium pratense</i>	"	"	930 570 530
<i>Polypodium Dryopteris</i>	37.90 fabr.	3.65 cent.	910 850 830
<i>Ranunculus repens</i>	"	"	910 830 710
<i>Taraxacum officinale</i>	"	"	910 680
<i>Pseudathyrium alpestre</i>	38.00 fabr.	3.70 cent.	... ? Higher ?
<i>Gentiana nivalis</i>	"	"	... ? "
<i>Salix Myrsinites</i>	"	"	... ? "
<i>Veronica saxatilis</i>	"	"	... ? "
<i>Carex capillaris</i>	"	"	... ? "
<i>Poa cæsia</i>	"	"	... ? "
<i>Sesleria cærulea</i>	"	"	... ? "
<i>Salix procumbens</i>	"	"	900
<i>Thlaspi alpestre</i>	"	"	900
<i>Bartsia alpina</i>	"	"	900
<i>Elyna caricina</i>	"	"	900
<i>Menziesia cærulea</i>	"	"	900
<i>Woodsia ilvensis</i>	"	"	900 630
<i>Draba (verna) inflata</i>	"	"	900
<i>Gnaphalium norvegicum</i>	"	"	900
<i>Lycopodium annotinum</i>	"	"	900 900 900
<i>Equisetum sylvaticum</i>	"	"	900 900 900
<i>Salix Lapponum</i>	"	"	900 900 860
<i>Potentilla alpestris</i>	"	"	900 900 830
<i>Tussilago Farfara</i>	"	"	900 900 830
<i>Rubus saxatilis</i>	"	"	900 900 760
<i>Hieracium anglicum</i>	"	"	900 900 690
<i>Parnassia palustris</i>	"	"	900 900 660
<i>Heracleum Sphondylium</i>	"	"	900 900 630
<i>Juniperus nana</i>	"	"	900 880 880



<i>Salix lanata</i>	38.00 fahr.	3.70 cent.	900 860 830
<i>Dryas octopetala</i>	"	"	900 830 800
<i>Trifolium repens</i>	"	"	900 830 750
<i>Arabis hirsuta</i>	"	"	900 830 530
<i>Stellaria media</i>	"	"	900 830 500
<i>Angelica sylvestris</i>	"	"	900 820 670
<i>Carex pulicaris</i>	"	"	900 810 810
<i>Ranunculus Flammula</i>	"	"	900 810 800
<i>Vaccinium Oxycoccos</i>	"	"	900 810 660
<i>Carex ampullacea</i>	"	"	900 780 760
<i>Geranium sylvaticum</i>	"	"	900 760 760
<i>Spiræa Ulmaria</i>	"	"	900 760 660
<i>Arbutus alpina</i>	"	"	900 760 630
<i>Betula nana</i>	"	"	900 700 650
<i>Sonchus alpinus</i>	"	"	900 660
<i>Carex pauciflora</i>	"	"	900 660 600
<i>Veronica Chamædrys</i>	"	"	900 630 530
<i>Spergula saginoides</i>	"	"	900 600
<i>Listera cordata</i>	"	"	900 570 500
<i>Epilobium angustifolium</i>	"	"	900 550 500
<i>Botrychium Lunaria</i>	"	"	900 510 400
<i>Festuca duriuscula</i>	"	"	900 500
<i>Lychnis diurna</i>	"	"	900 400
<i>Pyrus Aucuparia</i>	38.20 fahr.	3.80 cent.	880 830 700
<i>Scabiosa succisa</i>	38.40 fahr.	3.90 cent.	860 850 800
<i>Carex rupestris</i>	"	"	860 800
<i>Rhinanthus Crista</i>	38.50 fahr.	3.95 cent.	850 800 670
<i>Carex VahlII (alpina)</i>	"	"	850 800
<i>Arenaria verna</i>	"	"	850
<i>Astragalus alpinus</i>	"	"	850 800
<i>Hieracium cæsium</i>	"	"	850?
<i>Hieracium argenteum</i>	"	"	850?
<i>Hieracium senescens</i>	"	"	850?
<i>Pinus. (Planted ?)</i>	38.60 fahr.	4.00 cent.	840 800
<i>Hieracium nitidum</i>	38.70 fahr.	4.05 cent.	" 830 " B.
<i>Hieracium aggregatum</i>	"	"	" 830 " B.
<i>Hieracium lasiophyllum</i>	"	"	" 830 " B.
<i>Equisetum palustre</i>	"	"	830 810 710
<i>Poa trivialis</i>	"	"	830 700 530

<i>Urtica dioica</i>	38.70 fahr.	4.05 cent.	830 630 600
<i>Lysimachia nemorum</i>	38.90 fahr.	4.15 cent.	810 710 680
<i>Juncus effusus</i>	39.00 fahr.	4.20 cent.	800 780 750
<i>Hieracium prenanthoides</i>	"	"	800 760
<i>Juniperus communis</i>	"	"	800 730 720
<i>Juncus supinus</i>	"	"	800 710 680
<i>Veronica serpyllifolia</i>	"	"	800? 680 510
<i>Linum catharticum</i>	"	"	800 670 650
<i>Pyrola secunda</i>	"	"	800 640 530
<i>Anthyllis vulneraria</i>	"	"	800 570 400
<i>Gentiana campestris</i>	"	"	800 550 530
<i>Vicia Cracca</i>	"	"	800 500 400
<i>Habenaria viridis</i>	"	"	800 "830"
<i>Pyrola rotundifolia</i>	"	"	800
<i>Linnæa borealis</i>	"	"	800
<i>Salix arbuscula</i>	"	"	800
<i>Juncus lampocarpus</i>	"	"	"800"
<i>Carduus palustris</i>	"	"	800 670 610
<i>Erica Tetralix</i>	39.10 fahr.	4.25 cent.	790 760 720
<i>Drosera rotundifolia</i>	39.30 fahr.	4.35 cent.	770 700 630
<i>Carex panicea</i>	39.40 fahr.	4.40 cent.	760 730 750
<i>Carex curta</i>	"	"	760 710
<i>Poa pratensis</i>	39.50 fahr.	4.45 cent.	750 710 530
<i>Tofieldia palustris</i>	"	"	750 710 660
<i>Hypericum pulchrum</i>	"	"	750 700 680
<i>Pinus sylvestris</i>	39.60 fahr.	4.50 cent.	740 730 650
<i>Erica cinerea</i>	39.70 fahr.	4.55 cent.	730 730 710
<i>Genista anglica</i>	"	"	730 730 710
<i>Ajuga reptans</i>	"	"	730 610 510
<i>Prunella vulgaris</i>	39.80 fahr.	4.60 cent.	720 700 610
<i>Orobis tuberosus</i>	"	"	720 680 670
<i>Valeriana officinalis</i>	"	"	720 630 500
<i>Carduus heterophyllus</i>	"	"	720 430 350
<i>Hieracium Pilosella</i>	39.90 fahr.	4.65 cent.	710 710 710
<i>Equisetum limosum</i>	"	"	710 350
<i>Callitriche pedunculata</i>	"	"	710
<i>Subularia aquatica</i>	"	"	710
<i>Senecio Jacobæa?</i>	"	"	710 700 530
<i>Rumex Acetosella</i>	"	"	710 680 560

<i>Salix fusca</i> (repens)	39.90 fahr.	4.65 cent.	710 650 560
<i>Plantago lanceolata</i>	"	"	710 600 530
<i>Achillea Ptarmica</i>	"	"	710 500 500
<i>Viola flavicornis</i>	"	"	710 360
<i>Spergula subulata</i>	40.00 fahr.	4.70 cent.	700 or upwards.
<i>Salix aurita</i>	"	"	700 670 630
<i>Polypodium vulgare</i>	"	"	700 670 580
<i>Polystichum lobatum</i>	"	"	700 630
<i>Isoetes lacustris</i>	"	"	700? 500
<i>Epilobium tetragonum</i>	"	"	700 270
<i>Oxytropis campestris</i>	"	"	700?
<i>Carex sylvatica</i>	"	"	700?
<i>Betula alba</i>	40.20 fahr.	4.80 cent.	680 660 630
<i>Fragaria vesca</i>	"	"	680 500 450
<i>Gymnadenia Conopsea</i>	"	"	680 350 270
<i>Carex glauca</i>	40.30 fahr.	4.85 cent.	670 650 350
<i>Helianthemum vulgare</i>	"	"	670 610 570
<i>Salix nigricans</i>	40.40 fahr.	4.90 cent.	660 Higher?
<i>Salix phylicifolia</i>	"	"	660 Higher?
<i>Hieracium pallidum</i>	"	"	"660" B.
<i>Hieracium lingulatum</i>	"	"	"660" B.
<i>Sedum villosum</i>	"	"	660?
<i>Rubus idæus</i>	"	"	660 650 640
<i>Lychnis Flos-cuculi</i>	"	"	660 630 270
<i>Salix caprea</i>	"	"	660 610 500
<i>Crepis paludosa</i>	"	"	660 600 600
<i>Rosa mollis</i> (villosa?)	"	"	660 500 350
<i>Potentilla Fragariastrum</i>	"	"	660 450
<i>Myosotis repens</i>	"	"	660 400 350
<i>Callitriche</i> " verna "	"	"	660 350 350
<i>Spartium scoparium</i>	"	"	660 600 570
<i>Digitalis purpurea</i>	40.50 fahr.	4.95 cent.	650 650 630
<i>Pedicularis sylvatica</i>	"	"	650 650 610
<i>Lycopodium clavatum</i>	"	"	650 590 550
<i>Vicia sepium</i>	"	"	650 500 460
<i>Galium pusillum</i>	"	"	650?
<i>Pteris aquilina</i>	40.60 fahr.	5.00 cent.	640 570 530
<i>Carex speirostachya</i>	40.70 fahr.	5.05 cent.	630 500 350
<i>Epilobium palustre</i>	"	"	630 400 350

<i>Avena pratensis</i>	40.70 fahr.	5.05 cent.	630 600 570
<i>Stellaria Holostea</i>	"	"	630 600 430
<i>Carex pallescens</i>	"	"	630 600 410
<i>Briza media</i>	"	"	630 570 530
<i>Corylus Avellana</i>	"	"	630 520 350
<i>Habenaria albida</i>	"	"	630 400 350
<i>Juncus conglomeratus</i>	"	"	630 400 350
<i>Luzula pilosa</i>	"	"	630 400 150
<i>Viola tricolor</i>	"	"	630 350 150
<i>Asplenium A. nigrum</i>	"	"	630 ... ? 100
<i>Pyrola media</i>	41.00 fahr.	5.20 cent.	600 590 580
<i>Pedicularis palustris</i>	"	"	600 550 530
<i>Geranium pratense</i>	"	"	"600" "580"
<i>Plantago maritima</i>	"	"	600 460 400
<i>Hypochaeris radicata</i>	41.20 fahr.	5.30 cent.	580 560 530
<i>Drosera anglica</i>	"	"	580
<i>Galium verum</i>	41.30 fahr.	5.35 cent.	570 560 530
<i>Carduus lanceolatus</i>	"	"	570 560 500
<i>Rosa spinosissima</i>	"	"	570 480
<i>Pimpinella Saxifraga</i>	"	"	570 450 350
<i>Mercurialis perennis</i>	"	"	570 450 350
<i>Myrica Gale</i>	41.40 fahr.	5.40 cent.	560 530 510
<i>Triodia decumbens</i>	"	"	560 530 350
<i>Vicia sylvatica</i>	"	"	560 460 350
<i>Athyrium F. fœmina</i>	41.50 fahr.	5.45 cent.	550 530
<i>Populus tremula</i>	41.70 fahr.	5.55 cent.	530 500 450
<i>Ranunculus auricomus</i>	"	"	530 Higher?
<i>Geranium Robertianum</i>	"	"	530 500 450
<i>Plantago major</i>	"	"	530 460 430
<i>Potamogeton oblongus</i>	"	"	530 460 400
<i>Bunium flexuosum</i>	"	"	530 410 400
<i>Cynosurus cristatus</i>	"	"	530 410 350
<i>Lathyrus pratensis</i>	"	"	530 350 350
<i>Epilobium montanum</i>	"	"	530 350 300
<i>Poa nemoralis</i>	"	"	530 Higher?
<i>Lobelia Dortmanna</i>	"	"	530 Higher?
<i>Littorella lacustris</i>	"	"	530
<i>Sparganium natans</i>	"	"	530
<i>Rumex aquaticus</i>	41.80 fahr.	5.60 cent.	520 500 430



<i>Menyanthes trifoliata</i>	41.90 fahr.	5.65 cent.	510 480 400
<i>Ranunculus bulbosus</i>	"	"	510 480 350
<i>Holcus lanatus</i>	"	"	510 500 350
<i>Spergula nodosa</i>	"	"	510 "390"
<i>Alnus glutinosa</i>	42.00 fahr.	5.70 cent.	500 500 350
<i>Lastrea Filix-mas</i>	"	"	500 500 350
<i>Primula vulgaris</i>	"	"	500 480 400
<i>Glyceria fluitans</i>	"	"	500 480 350
<i>Guaphalium sylvaticum</i>	"	"	500 430 400
<i>Chrysanthemum Leucanth.</i>	"	"	500 400
<i>Carex ovalis</i>	"	"	500 350 350
<i>Veronica scutellata</i>	"	"	500 350 350
<i>Aira præcox</i>	"	"	500 350 350
<i>Utricularia vulgaris</i>	"	"	"500" Dickie
<i>Juncus acutiflorus</i>	42.40 fahr.	5.90 cent.	460 400 350
<i>Polygonum aviculare</i>	"	"	460 400 350
<i>Meum Athamanticum</i>	"	"	460 350 350
<i>Melica nutans</i>	42.50 fahr.	5.95 cent.	450 400 400
<i>Aira caryophyllea</i>	"	"	450 400 350
<i>Koeleria cristata</i>	"	"	450 400 300
<i>Primula veris</i>	"	"	450
<i>Alopecurus pratensis</i>	42.70 fahr.	6.05 cent.	430 400 350
<i>Centaurea nigra</i>	"	"	430 400 350
<i>Anthriscus sylvestris</i>	"	"	430 400 350
<i>Carduus arvensis</i>	"	"	430 350 350
<i>Avena pubescens</i>	"	"	430 Higher?
<i>Stellaria graminea</i>	42.90 fahr.	6.15 cent.	410 350 350
<i>Myosotis arvensis</i>	"	"	410 350 350
<i>Salix ambigua?</i>	43.00 fahr.	6.20 cent.	"400"
<i>Hieracium iricum</i>	"	"	"400" 350
<i>Hieracium crocatum</i>	"	"	400 Higher?
<i>Rosa canina</i>	"	"	400 Higher?

*Altitude 400 yards. Temp. 43.00 fahr. 6.20 cent.*

<i>Juncus bufonius</i> , 400. 350. 350.	<i>Myosotis versicolor</i> , 400. 350.
<i>Scirpus pauciflorus</i> , 400. 350. 350.	<i>Draba verna (vera)</i> , 400. 350.
<i>Alopecurus geniculatus</i> , 400. 350. 350.	<i>Sinapis arvensis</i> , 400. 350.
<i>Galeopsis Tetrahit</i> , 400. 350. 350.	<i>Bromus commutatus</i> , 400. 350.
<i>Pyrethrum inodorum</i> , 400. 350. 350.	<i>Urtica urens</i> , 400. 350.
<i>Artemisia vulgaris</i> , 400. 350. 350.	<i>Teucrium Scorodonia</i> , 400.

*Capsella Bursa*, 400. 350. 350.      *Festuca elatior*? 400.  
*Senecio vulgaris*, 400, 350. 350.      *Asperula odorata*, "400."  
*Bartsia Odontites*, 400. 350. 350.      *Geranium sanguineum*, 400?  
*Myriophyllum alterniflorum*, 400. 350. 350.      *Salix cinerea*, 400.  
*Callitriche platycarpa*, 400. 350. 350.      *Lonicera P.*, 400. 350. 150.  
*Cratægus Oxyacantha*, 390. 200.      Introduced higher.

*Altitude 350 yards. Temp. 43.50 fahr. 64.5 cent.*

*Hieracium gothicum*, 350?      *Hieracium corymbosum*, 350?  
*Pyrola minor*, 350.      *Senecio aquaticus*, 350.      Both higher?  
*Galium palustre*, 350. 350. 350.      *Melampyrum sylvaticum*, 350.  
*Myosotis cæspitosa*, 350. 350. 350.      *Equisetum arvense*, 350. 200.  
*Trifolium medium*, 350. 350. 350.      *Circæa alpina*, 350. 160.  
*Dactylis glomerata*, 350. 350. 350.      *Carex præcox*, 350.1  
*Spergula arvensis*, 350. 350. 350.      *Orchis latifolia*, 350.  
*Arrhenatherum*, 350. 350. 350.      *Holcus mollis*, 350. 150.  
*Bromus mollis*, 350. 350. 350.      *Stachys sylvatica*, 350. 150.  
*Lolium perenne*, 350. 350. 350.      *Scirpus palustris*, 350.  
*Viola (tricolor) arvensis*, 350. 350. 350.      *Geranium molle*, 350.  
*Raphanus Raphanistrum*, 350. 350. 350.      *Crepis virens*, 350.  
*Scirpus setaceus*, 350. 350. 330.      *Cerastium glomeratum*, 350.  
*Habenaria bifolia*, 350. 350. 270.      *Clinopodium vulgare*, 350.  
*Asplenium Trichomanes*, 350. 350. 300.      *Sonchus oleraceus*, 350.  
*Scleranthus annuus*, 350. 350. 270.      *Lepidium Smithii*, 350.  
*Veronica arvensis*, 350. 350. 270.      *Lamium purpureum*, 350.  
*Stachys palustris*, 350. 350. 270.      *Ranunculus hederaceus*, 350.  
*Triticum repens*, 350. 350. 270.      *Ranunculus aquatilis*, 350.  
*Phleum pratense*, 350. 350. 270.      *Euphorbia Helioscopia*, 350.  
*Rumex obtusifolius*, 350. 270. 250.      *Euphorbia Peplus*, 350.  
*Senecio sylvaticus*, 350. 270. 250.      *Lychnis vespertina*, 350.  
*Lapsana communis*, 350. 270. 150.      *Lycopsis arvensis*, 350.  
*Festuca pratensis*, 350. 270. 150.      *Centaurea Cyanus*, 350.  
*Agrostis alba*, 350. 270. 150.      *Polygonum Convolvulus*, 350.  
*Potentilla anserina*, 350. 270. 150.      *Myosotis collina*, 350.  
*Mentha arvensis*, 350. 270. 150.      *Vicia sativa*, 350.  
*Listera ovata*, 350. 250. 160.      *Carduus acanthoides*, 350.  
*Tanacetum*, 350.      *Humulus*, 350.      Both introduced?  
*Ribes Grossularia*, 350.      Most likely introduced.  
*Sedum Telephium*, 350. 250.      The same remark here.  
*Quercus Robur*, 350.      Planted there? "500 yards," Prof. Dickie.

*Prunus Padus*, 350. 350. Planted at these heights ?

*Fraxinus excelsior*, 350. 270. 250. Planted in all three ?

*Altitude* 300 yards. *Temp.* 44.00 fahr. 6.70 cent.

*Hymenophyllum Wilsoni*, 1000 feet, and doubtless higher.

*Ilex Aquifolium*, about 1000 feet, and perhaps higher.

*Schoenus nigricans*, about 1000 feet above Loch Eil.

*Altitude* 250 yards. *Temp.* 44.50 fahr. 6.95 cent.

*Ulex europæus*, 270. 250. Apparently native. Sown at 500 yards.

*Chenopodium Henricus*, 270. Most likely introduced.

*Sambucus nigra*, 270. 150. Planted only ?

*Campanula latifolia*, 273. *Brachypodium sylvat.*, 267. (Prof. Dickie).

*Rubus suberectus*, 270. 260. 150. *Malaxis paludosa*, 270.

*Polygonum Persicaria*, 270. 250. 150. *Peplis Portula*, 270.

*Phalaris arundinacea*, 270. 150. 100. *Silene inflata*, 270.

*Sanicula europæa*, 270. 150. 100. *Vicia hirsuta*, 270. 150.

*Chrysanthemum segetum*, "270." 250. 150. *Filago minima*, 250.

*Helosciadium inundatum*, 250. *Sedum acre*, 230.

*Alt. (about)* 200 yards. *Temp.* 45.00 fahr. 7.20 cent.

*Ribes petræum*. By the side of Loch Dochart.

*Sparganium minimum*. Base of Ben Lawers.

*Melica uniflora*. "Falls of Lawers."

*Carex hirta*. Loch of Kinnord.

*Alt. (say)* 150 yards. *Temp.* 45.50 fahr. 7.45 cent.

*Corydalis claviculata*. *Iris Pseudacorus*. *Prunus spinosa*.

*Geranium dissectum*. *Geum urbanum*. *Galeopsis versicolor*.

*Thalictrum majus*. *Torilis Anthriscus*. *Fumaria officinalis*.

*Rumex crispus*. *Littorella lacustris*. *Alchemilla arvensis*.

*Hypericum hirsutum*. *H. humifusum*. *Stellaria nemorum*.

*Viburnum Opulus*. *Galium Aparine*. *Scrophularia nodosa*.

*Arctium Lappa*. *Chenopodium album*. *Trifolium procumbens*.

*Ægopodium Podagraria*. *Myrrhis odorata*. Both introduced ?

## II. UPPER LIMITS IN NORTH ENGLAND.

(In the provinces of Lakes and Humber).

*Altitude* 1050 yards. *Temp.* 37.85 fahr. 3.75 cent.

*Carex rigida*, 1050. ... *Vaccinium Myrtillus*, 1050. 850.

*Festuca ovina*, 1050. 850. *Lycopodium Selago*, 1040. 850.

*Empetrum nigrum*, 1040. 850. *Allosorus crispus*, 1040. 850.



*Altitude 1000 yards. Temp. 38.35 fahr. 4.00 cent.*

- Salix herbacea, 1020. ... Galium saxatile, 1020. 850.  
 Saxifraga stellaris, 1020. 700. Rumex Acetosa, 1010. 850.  
 Oxalis Acetosella, 1010. 850. Cerastium viscosum, 1010. 850.  
 Thymus Serpyllum, 1010. 850. Campanula rotundifolia, 1010. 850.  
 Vaccinium Vitis-idæa, 1010. 850. Juncus squarrosus, 1000. 850.  
 Lycopodium alpinum, 1000. 850.

*Altitude 950 yards. Temp. 38.85 fahr. 4.25 cent.*

- Luzula campestris, 950. 850. Eriophorum vaginatum, 950. 600.

*Altitude 900 yards. Temp. 39.35 fahr. 4.50 cent.*

- Alchemilla alpina, 900. ... Sedum Rhodiola, 900. ...  
 Ranunculus acris, 900. 850. Taraxacum palustre, 900. 850.  
 Chrysosplenium oppositifol., 900. 850. Cardamine pratensis, 900. 800.  
 Anthoxanthum odoratum, 900. 750. Caltha palustris, 900. 600.  
 Pyrus Aucuparia, 900. 500. Hieracium mororum, 900. 300.

*Altitude 850 yards. Temp. 39.85 fahr. 4.75 cent.*

- Armeria maritima, 850. ... Juniperus nana, 850. ...  
 Potentilla Tormentilla, 850. 850. Viola sylvatica, 850. 850.  
 Geum rivale, 850. 800. Achillea Millefolium, 800. 850.  
 Calluna vulgaris, 800. 850. Anemone nemorosa, 800. 850.  
 Scirpus cæspitosus, 725. 850. Nardus stricta, 725. 850.  
 Rubus Chamæmorus, 725. 850. Poa annua, 720. 850.  
 Blechnum boreale, 700. 850. Cochlearia officinalis, 700. 850.  
 Bellis perennis, 700. 850. Trifolium repens, 700. 850.  
 Lycopodium clavatum, 700. 850. Alchemilla vulgaris, 680. 850.  
 Prunella vulgaris, 680. 850. Saxifraga hypnoides, 600. 850.  
 Arenaria verna, 600. 850. Hieracium Pilosella, 580. 850.  
 Veronica Chamædrys, 570. 850. Veronica officinalis, 560. 850.  
 Viola lutea, 510. 850. Rumex Acetosella, 510. 850.  
 Viola palustris, 850. 500. Lastrea dilatata, 500. 850.  
 Luzula sylvatica, 850. 500. Veronica serpyllifolia, 500. 850.  
 Cystopteris fragilis, 400. 850. Carex pilulifera, 850. 400.  
 Asplenium viride, 400. 850. Polystichum lobatum, 300. 850.

*Altitude 800 yards. Temp. 40.35 fahr. 5.00 cent.*

- Myosotis alpestris, "800." 800. (Locality said to be in both provinces).  
 Eriophorum angustifolium, 725. 800. Polypodium vulgare, 670. 800.  
 Carex binervis, 800. 600. Lastrea Filix-mas, 560. 800.  
 Polypodium Phegopteris, 800. 550. Carex vulgaris, 800. 400.  
 Solidago Virgaurea, 800. 400. Valeriana officinalis, 800. 400.



*Draba incana*, 300. 800.      *Sesleria cærulea*, 300. 800.

*Gentiana verna*, ... 800.      *Draba verna*, ... 800.

*Altitude 750 yards. Temp. 40.85 fahr. 5.25 cent.*

*Erica Tetralix*, 550. 750.      *Carex glauca*, 500. 750.

*Vaccinium Oxycoccos*, 450. 750.

*Altitude 700 yards. Temp. 41.35 fahr. 5.50 cent.*

*Aira flexuosa*, 725. 600.      *Stellaria uliginosa*, 720. 700.

*Juncus effusus*, 720. 600.      *Narthecium ossifragum*, 720. 300.

*Sagina procumbens*, 710. 600.      *Ranunculus repens*, 710. 450.

*Montia fontana*, 710. 350.      *Poa trivialis*, 710. 300.

*Silene acaulis*, 700? ...      *Saxifraga oppositifolia*, 700? ...

*Epilobium alsinifolium*, 700. 700.      *Sedum villosum*, 690. 700.

*Drosera rotundifolia*, 650. 700.      *Thalictrum alpinum*, 700? 600.

*Pinguicula vulgaris*, 700. 600.      *Triodia decumbens*, 600. 700.

*Euphrasia officinalis*, 700. 550.      *Agrostis vulgaris*, 700. 500.

*Ranunculus Flammula*, 700. 500.      *Luzula multiflora*, 700. 400.

*Apargia autumnalis*, 700. 350.      *Scirpus pauciflorus*, 700. 300.

*Altitude 650 yards. Temp. 41.85 fahr. 5.75 cent.*

*Saxifraga aizoides*, 690. 600.      *Carex stellulata*, 680. 600.

*Molinia cærulea*, 670. 600.      *Lychnis alpina*, "2000 feet."

*Carduus palustris*, 660. 600.      *Myosotis repens*, 660. 500.

*Juncus triglumis*, 650. ...      *Lycopodium selaginoides*, 650. 600.

*Carex pulicaris*, 650. 600.      *Plantago lanceolata*, 650, 550.

*Melampyrum pratense*, 650. 500.      *Gnaphalium dioicum*, 650. 500.

*Carex flava* (or *Æderi*), 650. 400.      *Juncus bufonius*, 650. 400.

*Altitude 600 yards. Temp. 42.35 fahr. 6.00 cent.*

*Epilobium palustre*, 640. 500.      *Carex dioica*, 630. 600.

*Carex panicea*, 630. 400.      *Juncus lampocarpus*, 620. 600.

*Briza media*, 620. 300.      *Tussilago Farfara*, 610. 600.

*Agrostis alba*, 610. 300.      *Oxyria reniformis*, 600. ...

*Trientalis europæa*, ... 600.      *Carex capillaris*, ... 600.

*Dryas octopetala*, ... 600.      *Bartsia alpina*, ... 600.

*Elyna caricina*, ... 600.      *Tofieldia palustris*, ... 600.

*Aira cæspitosa*, 600. 600.      *Scabiosa succisa*, 600. 600.

*Polygala vulgaris*, 580. 600.      *Urtica dioica*, 580. 600.

*Holcus lanatus*, 570. 600.      *Linum catharticum*, 600. 550.

*Primula farinosa*, 510. 600.      *Hieracium vulgatum*, 600. 500.

*Lotus corniculatus*, 600. 500.      *Hieracium anglicum*, 600. 500.

*Betula alba*, 600. 500.      *Pimpinella Saxifraga*, 600. 500.

Triglochin palustre, 450. 600.      Cratægus Oxyacantha, 450. 600.  
 Valeriana dioica, 410. 600.      Parnassia palustris, 600. 400.  
 Rhinanthus Crista-galli, 600. 400.      Juniperus communis, 400. 600.  
 Hypericum pulchrum, 600. 400.      Orobus tuberosus, 600. 400.  
 Potentilla Fragariastrum, 600. 400.      Crepis paludosa, 600. 400.  
 Menyanthes trifoliata, 600. 400.      Juncus acutiflorus, 600. 400.  
 Helianthemum vulgare, 360. 600.      Cardamine hirsuta, 600. 350.  
 Carduus arvensis, 350. 600.      Anthyllis vulneraria, 320. 600.  
 Gentiana Amarella, 320. 600.      Gentiana campestris, 300. 600.  
 Thalictrum minus, 600. 300.      Helianthemum canum, 200. 600.  
 Plantago maritima, ... 600.      Koeleria cristata, ... 600.  
 Carex præcox, ... 600.      Hippocrepis comosa, ... 600.

*Altitude 550 yards. Temp. 42.85 fahr. 6.25 cent.*

Athyrium Filix-fœmina, 590. 500.      Potamogeton oblongus, 590. 500.  
 Cynosurus cristatus, 580. 400.      Digitalis purpurea, 570. 400.  
 Ajuga reptans, 560. 500.      Pteris aquilina, 560. 500.  
 Epilobium montanum, 560. 450.      Carex ovalis, 560. 450.  
 Angelica sylvestris, 560. 400.      Geranium sylvaticum, 560. 400.  
 Spiræa Ulmaria, 560. 400.      Lysimachia nemorum, 560. 400.  
 Luzula pilosa, 560. 400.      Juncus conglomeratus, 560. 400.  
 Vicia sepium, 560. 350.      Genm urbanum, 560. 300.  
 Apargia hispida, 560. 300.      Polygala uliginosa, ... 550.  
 Stellaria media, 520. 550.      Plantago major, 520. 550.  
 Arbutus Uva-ursi, 500. 550.      Galium boreale, 550. 500.  
 Polypodium Dryopteris, 500. 550.      Poa pratensis, 500. 550.  
 Carduus lanceolatus, 500. 550.      Veronica arvensis, 500. 550.  
 Arenaria serpyllifolia, 500. 550.      Carduus nutans, 370. 550.  
 Senecio Jacobæa, 360. 550.      Spargula nodosa, 550. 350.  
 Saxifraga tridactylites, 300. 550.      Poterium Sanguisorba, 300. 550.  
 Salix fusca or repens, 550. 250.      Pedicularis sylvatica, 540. 400.

*Altitude 500 yards. Temp. 43.35 fahr. 6.50 cent.*

Galium palustre, 520. 400.      Alopecurus geniculatus, 520. 300.  
 Veronica Beccabunga, 510. 400.      Trifolium pratense, 510. 400.  
 Senecio aquaticus, 510. 400.      Rumex obtusifolius, 510. 400.  
 Aira præcox, 510. 350.      Callitriche verna, 510. 300.  
 Salix phylicifolia, ... 500.      Botrychium Lunaria, ... 500.  
 Hieracium pallidum, ... 500.      Hieracium iricum, ... 500.  
 Asplenium septentrionale, 500. ...      Pyrola secunda, 500? 500.  
 Taraxacum officinale, 500. ...      Erica cinerea, 500. 500.

*Rubus Idæus*, 500. 500.      *Glyceria fluitans*, 500. 500.  
*Veronica scutellata*, 480. 500.      *Stellaria graminea*, 480. 500.  
*Epilobium angustifolium*, 450. 500.      *Geranium Robertianum*, 500. 450.  
*Mentha aquatica*, 450. 500.      *Sanguisorba officinalis*, 450. 500.  
*Rosa mollis* (villosa ?), 420. 500.      *Orchis maculata*, 500. 400.  
*Arabis hirsuta*, 500. 400.      *Heracleum Sphondylium*, 500. 400.  
*Corylus Avellana*, 400. 500.      *Hypochæris radicata*, 400. 500.  
*Lonicera Periclymenum*, 500. 400.      *Salix aurita*, 370. 500.  
*Centaurea nigra*, 360. 500.      *Quercus Robur*, 360. 500.  
*Potentilla alpestris*, 350. 500.      *Prunus Padus*, 350. 500.  
*Ilex Aquifolium*, 500. 350.      *Ranunculus hederaceus*, 500. 300.  
*Hyacinthus nonscriptus*, 500. 300.      *Saxifraga granulata*, 250. 500.  
*Spartium scoparium*, 500. 250.      *Geranium molle*, 500. ...

*Altitude 450 yards. Temp. 43.85 fahr. 6.75 cent.*

*Myosotis cæspitosa*, 480. 400.      *Scirpus setaceus*, 480. 300.  
*Listera cordata*, ... 450.      *Circæa alpina*, 450. ...  
*Hieracium cæsium*, ... 450.      *Avena pratensis*, ... 450.  
*Utricularia minor*, ... 450.      *Asplenium Ad. nigrum*, 450. ...  
*Equisetum palustre*, 450. 400.      *Pedicularis palustris*, 450. 400.  
*Juncus supinus*, 450. 400.      *Dactylis glomerata*, 350. 450.  
*Hedera Helix*, 350. 450.      *Galium pusillum*, 450. 300.  
*Prunus spinosa*, 300. 450.      *Hypericum hirsutum*, 300. 450.  
*Mercurialis perennis*, 300. 450.      *Asplenium Trichomanes*, 300. 450.  
*Lactuca muralis*, 300. 450.      *Origanum vulgare*, 300. 450.  
*Comarum palustre*, 450. 250.      *Polygonum Hydropiper*, 450. 250.  
*Asplenium Ruta-muraria*, 450. 250.

*Altitude 400 yards. Temp. 44.35 fahr. 7.00 cent.*

*Habenaria viridis*, 420. 400.      *Salix caprea*, 420. 400.  
*Primula vulgaris*, 420. 400.      *Bunium flexuosum*, 420. 400.  
*Habenaria bifolia*, 420. 350.      *Rosa canina*, 420. 300.  
*Polygonum viviparum*, ... 400.      *Potentilla fruticosa*, ... 400.  
*Hieracium gothicum*, ... 400.      *Eriophorum latifolium*, ... 400.  
*Hutchinsia petræa*, ... 400.      *Myrica Gale*, 400. ...  
*Lastrea Oreopteris*, 400. 400.      *Fraxinus excelsior*, 400. 400.  
*Galium verum*, 370. 400.      *Fragaria vesca*, 360. 400.  
*Teucrium Scorodonia*, 360. 400.      *Ranunculus cænosus*, 400. 350.  
*Equisetum sylvaticum*, 350. 400.      *Achillea Ptarmica*, 350. 400.  
*Habenaria albida*, 350. 400.      *Geranium pratense*, 350. 400.  
*Lathyrus pratensis*, 350. 400.      *Anthriscus sylvestris*, 350. 400.



*Salix cinerea*, 350. 400.     *Littorella lacustris*, 350. 400.  
*Campanula latifolia*, 350. 400.     *Peplis Portula*, 340. 400.  
*Potentilla anserina*, 320. 400.     *Ulex europæus*, 320. 400.  
*Trollius europæus*, 300. 400.     *Lychnis Flos-cuculi*, 300. 400.  
*Callitriche platycarpa*, 400. 300.     *Carex speirostachya*, 400. 300.  
*Alopecurus pratensis*, 300. 400.     *Hieracium crocatum*, 300. 400.  
*Trifolium medium*, 300. 400.     *Equisetum arvense*, 300. 400.  
*Festuca pratensis*, 300. 400.     *Listera ovata*, 300. 400.  
*Triticum repens*, 300. 400.     *Phalaris arundinacea*, 300. 400.  
*Sedum Telephium*, 300. 400.     *Polygonum Persicaria*, 400. 300.  
*Rumex crispus*, 300. 400.     *Equisetum variegatum*, 300. 400.  
*Geranium lucidum*, 300. 400.     *Juncus glaucus*, 400. 300.  
*Ranunculus auricomus*, 200. 400.     *Avena pubescens*, ... 400.  
*Scirpus palustris*, ... 400.     *Hieracium umbellatum*, ... 400.  
*Helosciadium inundatum*, ... 400.     *Lotus major*, ... 400.  
*Pyrus Aria*, ... 400.     *Glyceria plicata*, ... 400.  
*Polypodium calcareum*, 100. 400.     *Alchemilla arvensis*, 370. 300.

*Altitude 350 yards. Temp. 44.85 fahr. 7.25 cent.*

*Scabiosa columbaria*, 360. 350.     *Plantago media*, 360. 350.  
*Hieracium boreale*, 360. 300.     *Stachys Betonica*, 360. 300.  
*Lobelia Dortmanna*, 350. ...     *Nymphæa alba*, 350 ...  
*Capsella Bursa-pastoris*, 350. 350.     *Galeopsis Tetrahit*, 350. 300.  
*Viola tricolor*, 320. 350.     *Silene maritima*, 350. 300.  
*Alnus glutinosa*, 350. 300.     *Chrysanthemum Leucanthemum*, 350. 300.  
*Myriophyllum spicatum*, 350. 300.     *Senecio vulgaris*, 350. 300.  
*Bromus mollis*, 350. 300.     *Cerastium glomeratum*, 350. 300.  
*Triticum caninum*, 350. 300.     *Trifolium minus*, 350. 300.  
*Hydrocotyle vulgaris*, 350. 300.     *Carduus heterophyllus*, 300. 350.  
*Callitriche pedunculata*, 300. 350.     *Epilobium tetragonum*, 300. 350.  
*Rosa spinosissima*, 300. 350.     *Primula veris*, 300. 350.  
*Sinapis arvensis*, 300. 350.     *Spergula arvensis*, 300. 350.  
*Sonchus oleraceus*, 300. 350.     *Ranunculus aquatilis*, 300. 350.  
*Geranium dissectum*, 300. 350.     *Aretium Lappa*, 300. 350.  
*Potentilla reptans*, 300. 350.     *Vicia Cracca*, 350. 250.  
*Sanicula europæa*, 350. 250.     *Cardamine sylvatica*, 250. 350.  
*Nasturtium officinale*, 250. 350.     *Carlina vulgaris*, 250. 350.  
*Milium effusum*, 350 ...     *Orchis latifolia*, ... 350.  
*Euphorbia Peplus*, ... 350.     *Raphanus Raphanistrum*, ... 350.  
*Vicia sativa*, ... 350.     *Scandix Pecten*, ... 350.



- Scolopendrium vulgare*, ... 350.      *Carex remota*, ... 350.  
*Carex hirta*, ... 350.      *Spiræa Filipendula*, ... 350.  
*Altitude 300 yards. Temp. 45.35 fahr. 7.50 cent.*  
*Blysmus compressus*, 340. 300.      *Potamogeton densus*, 340 ...  
*Polygonum aviculare*, 330. 300.      *Populus tremula*, 320. 300.  
*Ulmus montana*, 320. 300.      *Avena flavescens*, 320. 300.  
*Galium Mollugo*, 320. 250.      *Medicago lupulina*, 320 ...  
*Stellaria Holostea*, 300. 300.      *Rumex aquaticus*, 300. 300.  
*Gnaphalium sylvaticum*, 300. 300.      *Melica nutans*, 300. 300.  
*Meum Athamanticum*, 300. 300.      *Myosotis arvensis*, 300. 300.  
*Urtica urens*, 300. 300.      *Bartsia Odontites*, 300. 300.  
*Asperula odorata*, 300. 300.      *Geranium sanguineum*, 300. 300.  
*Clinopodium vulgare*, 300. 300.      *Stachys sylvatica*, 300. 300.  
*Lolium perenne*, 300. 300.      *Phleum pratense*, 300. 300.  
*Sedum acre*, 300. 300.      *Euphorbia Helioscopea*, 300. 300.  
*Melica uniflora*, 300. 300.      *Myrrhis odorata*, 300. 300.  
*Galium Aparine*, 300. 300.      *Torilis Anthriscus*, 300. 300.  
*Sherardia arvensis*, 300. 300.      *Sonchus asper*, 300. 300.  
*Salix pentandra*, 300. 300.      *Atriplex angustifolia*, 300. 300.  
*Lemna minor*, 300. 300.      *Chenopodium B. Henricus*, 300. 300.  
*Hieracium tridentatum*, 300. 300.      *Hieracium strictum*, 300. 300.  
*Serratula tinctoria*, 300. 300.      *Knautia arvensis*, 300. 300.  
*Silaua pratensis*, 300. 300.      *Epilobium parviflorum*, 300. 300.  
*Ribes Grossularia*, 300. 300.      *Glechoma hederacea*, 300. 300.  
*Chærophyllum temulentum*, 300. 300.      *Rubus fruticosus*, 300. 300.  
*Allium ursinum*, 300. 300.      *Erysimum Alliaria*, 300. 300.  
*Hypericum quadrangulum*, 300. 300.      *Pyrus Malus*, 300. 250.  
*Scrophularia nodosa*, 300. 250.      *Fumaria officinalis*, 300. 250.  
*Veronica agrestis*, 300. 250.      *Circæa lutetiana*, 300. 250.  
*Ononis arvensis*, 300. 250.      *Aquilegia vulgaris*, 300. 250.  
*Paris quadrifolia*, 300. 250.      *Brachypodium sylvaticum*, 300. 250.  
*Campanula glomerata*, 300. 250.      *Viola hirta*, 300. 250.  
*Lychnis diurna*, 250. 300.      *Lapsana communis*, 250. 300.  
*Holcus mollis*, 250. 300.      *Lamium purpureum*, 250. 300.  
*Polygonum Convolvulus*, 250. 300.      *Carduus acanthoides*, 250. 300.  
*Viburnum Opulus*, 250. 300.      *Trifolium procumbens*, 250. 300.  
*Sonchus arvensis*, 250. 300.      *Conium maculatum*, 250. 300.  
*Centaurea Scabiosa*, 250. 300.      *Polygonum lapathifolium*, 250. 300.  
*Anagallis tenella*, 250. 300.      *Hypericum perforatum*, 200. 300.

- Æthusa Cynapium*, 200. 300.      *Thlaspi alpestre*, ... 300.  
*Rubus saxatilis*, ... 300.      *Adoxa Moschatellina*, ... 300.  
*Carex ampullacea*, ... 300.      *Carex curta*, ... 300.  
*Genista anglica*, ... 300.      *Drosera anglica*, ... 300.  
*Meconopsis cambrica*, ... 300.      *Polygonum Bistorta*, ... 300.  
*Ranunculus Ficaria*, ... 300.      *Teesdalia nudicaulis*, ... 300.  
*Actæa spicata*, ... 300.      *Ranunculus bulbosus*, ... 300.  
*Aira caryophyllæa*, ... 300.      *Bromus commutatus*, ... 300.  
*Myosotis versicolor*, ... 300.      *Catabrosa aquatica*, ... 300.  
*Pyrola minor*, ... 300.      *Melampyrum sylvaticum*, ... 300.  
*Hypericum humifusum*, ... 300.      *Equisetum umbrosum*, ... 300.  
*Orchis mascula*, ... 300.      *Veronica hederifolia*, ... 300.  
*Daucus Carota*, ... 300.      *Plantago Coronopus*, ... 300.  
*Avena fatua*, ... 300.      *Potamogeton heterophyllus*, ... 300.  
*Agrostis canina*, ... 300.      *Festuca elatior*, ... 300.  
*Poa compressa*, ... 300.      *Atriplex hastata*, ... 300.  
*Arabis thaliana*, ... 300.      *Galium cruciatum*, ... 300.  
*Filago germanica*, ... 300.      *Senecio sylvaticus*, ... 300.  
*Anthemis arvensis*, ... 300.      *Taxus baccata*, ... 300.  
*Epipactis latifolia*, ... 300.      *E. ovalis (atrorubens)*, ... 300.  
*Glyceria rigida*, ... 300.      *Festuca bromoides*, ... 300.  
*Cardamine amara*, ... 300.      *Convallaria majalis*, ... 300.  
*Ceterach officinarum*, ... 300.      *Polystichum angulare*, ... 300.  
*Brassica (camp.) "Napus,"* ... 300.      *Rubus cæsius*, ... 300.  
*Sagina apetala*, ... 300.      *Malva moschata*, ... 300.  
*Acer campestre*, ... 300.      *Trifolium striatum*, ... 300.  
*Cornus sanguinea*, ... 300.      *Sambucus nigra*, ... 300.  
*Atropa Belladonna*, ... 300.      *Myosotis sylvatica*, ... 300.  
*Scirpus fluitans*, ... 300.      *Cyperus fuscus*, ... 300.  
*Festuca Pseudo-myurus*, ... 300.      *Crepis virens*, 300. ...  
*Carex sylvatica*, 300. ...      *Hymenophyllum Wilsoni*, 300 ...  
*Corydalis claviculata*, 300. ...      *Veronica Anagallis*, 300. ...  
*Ophioglossum vulgatum*, 300. ...      *Silene inflata*, 300 ...  
*Gnaphalium uliginosum*, 300. ...      *Festuca sylvatica*, 300. ...  
*Hypericum montanum*, 300. ...      *Veronica polita*, 300. ...  
*Ulex nanus*, 300. ... (Perhaps introduced there).

*Altitude* 250 yards.      *Temp.* 45.85 fahr.      7.75 cent.

*Petasites vulgaris*, 250. 250.      *Mentha sativa*, 250. 250.

*Sisymbrium officinale*, 250. 250.      *Bromus asper*, 250. 250.

- Pyrethrum Parthenium*, 250. 250.      *Solanum Dulcamara*, 250. 200.  
*Ribes petræum* or *rubrum*, 250. 250.      *Cornus suecica*, ... 250.  
*Chrysosplenium alternifolium*, ... 250.      *Carex pauciflora*, ... 250.  
*Salix nigricans*, ... 250.      *Vicia sylvatica*, ... 250.  
*Artemisia vulgaris*, ... 250.      *Stellaria nemorum*, ... 250.  
*Prunus avium*, ... 250.      *Hypericum Elodes*, ... 250.  
*Hippuris vulgaris*, ... 250.      *Lamium incisum*, ... 250.  
*Scirpus lacustris*, ... 250.      *Arundo Phragmites*, ... 250.  
*Artemisia Absinthium*, ... 250.      *Papaver Rhœas*, ... 250.  
*Sparganium ramosum*, ... 250.      *Carex paniculata*, ... 250.  
*Cynoglossum officinale*, ... 250.      *Orobanche rubra*, 250.  
*Malva sylvestris*, ... 250.      *Lithospermum officinale*, ... 250.  
*Parietaria officinalis*, ... 250.      *Ranunculus Lingua*, ... 250.  
*Carex muricata*, ... 250.      *Carex vesicaria*, ... 250.  
*Bromus sterilis*, ... 250.      *Cerastium arvense*, ... 250.  
*Nuphar lutea*, ... 250.      *Potentilla verna*, ... 250.  
*Euphorbia exigua*, ... 250.      *Hypericum dubium*, ... 250.  
*Epipactis palustris*, ... 250.      *Geranium columbinum*, ... 250.  
*Euonymus europæus*, ... 250.      *Ribes alpinum*, ... 250.  
*Chelidonium majus*, ... 250.      *Arum maculatum*, ... 250.  
*Tamus communis*, ... 250.      *Rhamnus catharticus*, ... 250.  
*Linum perenne*, ... 250.      *Cypripedium Calceolus*, ... 250.  
*Salix purpurea*, ... 250.      *Rumex pratensis*, ... 250.  
*Carex digitata*, ... 250.      *Acorus Calamus*, ... 250.  
*Equisetum limosum*, 250. ...      *Carex pallescens*, 250. ...  
*Stachys palustris*, 250. ...      *Lychnis vespertina*, 250. ...  
*Humulus Lupulus*, 250. ...      *Rubus suberectus*, 250. ...  
*Malaxis paludosus*, 250. ...      *Œnanthe crocata*, 250. ...  
*Jasione montana*, 250. ...      *Tragopogon pratensis*, 250. ...  
*Agrimonia Eupatoria*, 250. ...      *Anagallis arvensis*, 250. ...  
*Rumex sanguineus*, 250. ...      *Carex remota*, 250. ...  
*Bromus giganteus*, 250. ...      *Myosotis palustris*, 250. ...  
*Genista tinctoria*, 250 ...      *Rubus corylifolius*, 250. ...  
                                  *Altitude 200 yards. Temp. 46.35 fahr. 8.00 cent.*  
*Papaver dubium*, ... 200.      *Erythræa Centaurium*, ... 200.  
*Malva rotundifolia*, ... 200.      *Lysimachia vulgaris*, ... 200.



## III. UPPER LIMITS ELSEWHERE.

(West Sutherland, Hebrides, Shetland, Carnarvon).

<i>Solidago Virgaurea</i>	36.55 fahr.	2.90 cent.	970 Suthd.
<i>Gnaphalium diocum</i>	36.95 fahr.	3.10 cent.	930 Suthd.
<i>Arbutus alpina</i>	37.25 fahr.	3.25 cent.	900 Suthd.
<i>Hymenophyllum Wilsoni</i>	37.15 fahr.	3.25 cent.	950 Hebr.
<i>Luzula sylvatica</i>	38.25 fahr.	3.75 cent.	800 Suthd.
<i>Sedum anglicum</i>	37.80 fahr.	3.80 cent.	1110 Carn.
<i>Polypodium vulgare</i>	39.25 fahr.	4.25 cent.	700 Suthd.
<i>Erica cinerea</i>	41.25 fahr.	5.25 cent.	500 Suthd.
<i>Ranunculus Ficaria</i>	40.90 fahr.	5.35 cent.	800 Carn.
<i>Ranunculus hederaceus</i>	41.20 fahr.	5.50 cent.	770 Carn.
<i>Scilla verna</i>	42.16 fahr.	5.60 cent.	300 Shetd.
<i>Plantago lanceolata</i>	41.40 fahr.	5.60 cent.	750 Carn.
<i>Chrysanthemum Leucanth.</i>	41.90 fahr.	5.85 cent.	700 Carn.
<i>Meconopsis cambrica</i>	41.90 fahr.	5.85 cent.	700 Carn.
<i>Ulex europæus</i>	41.90 fahr.	5.85 cent.	700 Carn.
<i>Lonicera Periclymenum</i>	42.00 fahr.	5.90 cent.	"600 Dur."
<i>Hymenophyllum Wilsoni</i>	42.40 fahr.	6.10 cent.	650 Carn.
<i>Asplenium Trichomanes</i>	42.40 fahr.	6.10 cent.	650 Carn.
<i>Adoxa Moschatellina</i>	42.40 fahr.	6.10 cent.	650 Carn.
<i>Lonicera Periclymenum</i>	43.65 fahr.	6.45 cent.	260 Suthd.
<i>Mercurialis perennis</i>	43.10 fahr.	6.45 cent.	580 Carn.
<i>Ilex Aquifolium</i>	44.15 fahr.	6.70 cent.	210 Suthd.
<i>Cotyledon Umbilicus</i>	45.40 fahr.	7.60 cent.	350 Carn.
<i>Jasione montana</i>	45.40 fahr.	7.60 cent.	350 Carn.
<i>Mænchia glauca</i>	46.60 fahr.	8.20 cent.	230 Carn.

## IV. EXPLANATIONS OF THE UPPER LIMITS.

The preceding lists will appear somewhat complex on first view. Attention to the following explanatory observations will soon render them intelligible. The names of the plants succeed each other in accordance with the highest points or places at which they have been noted. The figures used to denote the altitudes always intend English yards of three feet. The measurements are here seldom carried to the units below ten yards; that sort of minuteness being unnecessary, and tending greatly to confuse the figures. The assumed temperature for



the altitude is added, in accordance with the scales or rates of decrease before suggested, on pages 162 to 166. But in looking at the figures for the two scales, Fahrenheit and centigrade, it must still be recollected that the rates of decrease were expressly adapted to the two different thermometers, and thus could not be rendered exactly correspondent one with another. (Page 214). Consequently, the temperatures expressed by the decimal figures printed on the same lines in the list here under notice, as being the temperatures for the given altitudes, according to the two thermometrical scales, will not be found exactly equal one with another; the difference between them being very slight at first, and becoming wider as the altitude increases. At the lowest altitudes (say, below 250 yards, in the latitude of the Grampian mountains) the Fahrenheit scale is slightly in excess over the centigrade. At the highest altitudes, their slight differences are more than reversed; the centigrade being there in excess over the Fahrenheit scale. These differences may be rendered more obvious at a glance, by printing the true correspondence or equality, along with the figures from the two scales, as the latter are applied in this volume. In latitude 57, from the sea-level upwards, we may trace the following series of figures, on looking to that portion of the preceding lists which relates to the upper limits of plants on the Grampian mountains, page 323 :—

0 yards.	47 fahr.	8.20 cent.	8.33 true corresp.
200	45	7.20	7.22
400	43	6.20	6.11
600	41	5.20	5.00
800	39	4.20	3.89
1000	37	3.20	2.78
1200	35	2.20	1.67
1400	33	1.20	0.56

So that, at the highest altitude, 1400 yards, the inequality between the two scales, arising out of their different rates of decrease, attains to 0.64, or nearly two-thirds of a degree,—centigrade in excess over Fahrenheit. It is impossible yet to say confidently, which of these two is the more accurate; though probability seems in favour of the centigrade, as more nearly correct in its rate of decrease upwards. Indeed, the Fahrenheit scale is added only for the convenience of those phyto-geographers who are unaccustomed to use the other thermometer, and to whom its figures consequently express the temperatures less clearly or less significantly.

A remark is incorrectly applied on page 158, immediately underneath

the two lines of figures, which it may be well here to set right. On comparing the extreme temperatures for the whole of Britain, the south coast of England with the summits of the northern hills, the rate of decrease adapted to the centigrade scale will be found slower or less than that adapted to the Fahrenheit scale. But in looking to latitude exclusively, apart from elevation, the reverse holds true; the rate of decrease by the centigrade scale being made very slightly quicker (not "slower or less") than that given as adapted to the thermometer of Fahrenheit. The reader is requested to make this correction with his pen, on page 158, by erasing the words "slower or less than," and introducing the words "in excess over" in their place. The difference, however, is very slight. The two scales begin on perfect equality, as 50 fahr. and 10 cent., in latitude 51. Northwards from thence the latter gradually increases on the former; so that, in latitude 61, we place 45 fahr. and 7 cent. as if equal; the true correspondence being 45 fahr. and 7.22 cent. as above shown. So nearly equal are the two rates, that ten degrees of latitude do not raise the difference to a quarter of a degree of temperature by centigrade scale. These remarks on the indications of temperature are applicable to the three subdivisions of the general list. In some other respects the explanations are better given separately for each subordinate division.

1. *Upper limits on the Grampian Mountains.*—The names of the plants here succeed each other in accordance with the three (or fewer) figures which terminate the lines. Those figures show the highest spots at which the plants have been noted by the author; with some few additions from other sources, mostly distinguished by inverted commas or other indications. The highest spots being equal for two or more species, then the second or the third figure is taken to determine their relative places in the list. The heights for the *Hieracia*, quoted between inverted commas, as "1400," and followed by the initial letter B, are taken from Mr. Backhouse's Monograph of the genus before mentioned, on page 3 and elsewhere. In the latter portions of the list, where the same figures for temperature and altitude apply to numerous species, some needless repetition of them is avoided by their conversion into head-titles of sections.

The basis of the list here printed for the Grampians, was originally published in the first volume of the London Journal of Botany, for the year 1842, pages 62 to 72. Since that date other hills have been

examined, and some of the old ground has been re-examined ; so that the present list is now drawn from notes considerably more extended. Increased experience, it may be trusted, has led also to increased accuracy in processes so liable to uncertainty and error on the part of those who seek to determine altitudes. Unless otherwise shown, as by the inverted commas or added authority, the present writer must be held responsible for all the heights stated in the list. His *datum* during measurements has seldom been the sea-level. The summit of Ben Lawers, at 3950 feet, has given one *datum* ; with which to compare the altitudes in Mid Perth, &c. Kingussie, at 750 feet, has given a second *datum* ; with which to compare a wide mountainous tract about Loch Erricht. And the village of Castletown in Braemar, at 1070 feet, has been a third *datum* ; used for the south-west of Aberdeenshire and adjacent portions of Perthshire and Forfarshire. Those three heights have been published on authority held safe and reliable.

But in assuming the alleged altitudes of those three places to be quite correct as starting points, it is not pretended that the hundreds of other altitudes have all been ascertained with like accuracy. On the contrary, the reader is here requested to look back to an explanation about the difference between measured and estimated altitudes, incidentally given on pages 213, 214 of volume third, under the head of *Cynosurus cristatus*. And if desirous of further information as to the manner of taking the heights of stations, he will find it more fully explained in the volume of the London Journal of Botany, above referred to. It may be shortly stated here, that many of the figures introduced into the list are estimates formed in a similar manner with the one explained for *Cynosurus cristatus*. The heights of two spots being taken as precisely as the quality of the instruments and state of weather would allow, the altitudes of plants noted between those two spots were estimated or guessed according to their successive appearance between the two spots, and their apparent distances from one or both of them. The altitudes for various plants noted at or about the particular spots so measured,—often a hill-summit or table-land,—or the true heights of which were supposed to be known otherwise on some good authority, must be deemed more closely correct. But in truth all modes of taking heights indirectly, through the aid of instruments which indicate simply the pressure of the atmosphere and its temperature, as data from which the heights are to be calculated, are liable to grave errors occasionally ; although with due care they may suffice to give fair approximations,



which are always to be read with the qualifying phrase of "more or less" in the mind of the reader.

Illustrations of the sort of uncertainty intended, and the need of keeping in mind the qualifying "more or less," might be obtained within the compass of this volume, on rigidly comparing the heights indicated in the 'Summary of Distribution' (by the letters "c a u") with the limits stated in the list here under explanation. It has been finally arranged for printing since the 'Summary' was all printed off; some few of the altitudes being slightly altered on re-calculation, or on account of some additional locality, not taken into account while the 'Summary' was under preparation for the press. For example, *Valeriana officinalis* and *Carduus heterophyllus* are not marked by the letter 'u' in the 'Summary,' as belonging to the upper stage of altitude; while on page 329 their upper limits are carried to 720 yards; and they might consequently have been held to inhabit the upper stage, or that between 700—1400 yards. In volume second they were carried up to 650 and 700 yards; steps of less than 50 yards being seldom made in the former volumes; and hence they were not lettered for the upper stage.

Notes on the altitudes attained by the *Hieracia*, taken at intervals during a score of past years, are of course inapplicable to the more segregated species recently published in the Monograph by Mr. Backhouse. The altitudes given by this gentleman are therefore substituted; his list of species having been incorporated in the 'Summary of Distribution' with one exception and one addition. It is suspected, however, that the altitudes stated in the book of Mr. Backhouse can be intended only as very rough guesses; and that they have in no case been ascertained through instrumental observation. Perhaps they are quite as true and reliable as the so-called species themselves; which no botanist seems able to make out by the diffuse and non-contrasting descriptions in the book; although Mr. Backhouse can himself doubtless label most specimens empirically in close accordance with his own nomenclature;—much as an amateur florist can point out well enough his *dukes* and *lords*, *generals* and *admirals*, *superbs* and *defiances*, among his roses, tulips, dahlias, and other fancy flowers; though botanists are unable to express their trivial differences in an intelligible manner by the language of science.

Dr. Dickie published a series of altitudes for the plants of Aberdeenshire, in the second volume of the London Journal of Botany, pages



134—5. Some of these are valuable additions, incorporated in the list here under explanation. The greater number of them were found not available; as only indicating heights far within those already ascertained for the same species. For example, it being sufficiently known that *Montia fontana* occurs at the sea-level, at the height of 3000 feet, and at various other intermediate spots, a formal record of the height of 1900 feet for the same very common plant can scarcely be said to have any value in science; or, at any rate, it is not required here. On examining the list by Dr. Dickie, there appears to be a difference between his measurements and those made by the present writer, which is of some consequence to the matter in hand. Dr. Dickie appears to give considerably higher figures for the same spots; and consequently also for the same plants, where his measurements do relate to their actual upper limits, and not merely to the intermediate altitudes as above instanced in the *Montia*.

As here printed, the altitudinal figures for plants on the tract of the Grampians are abbreviated from a manuscript list carried out to more minute and numerous details. The measurements were originally calculated in feet, and the estimates were made accordingly in even numbers of feet. In here converting them into yards, almost all fractions under ten yards have been omitted. So that 1000 feet thus become 330 yards only, 2000 feet become 660 yards only, while 3000 feet divide into the equal altitude of 1000 yards. This loss in the process of converting feet into yards, and dropping the units, occasionally gives an appearance of mis-position to names in the list, where one stands above another on account of a small difference in the number of feet for the first or second figure. Half a dozen species are here subjoined from the manuscript list, with their altitudes, as an example of the data from which that of the preceding pages is abbreviated:—

*Calluna vulgaris*, 3300. 3250. 3200. 3170. 3140. 2950. 2900. etc.

*Juniperus nana*, 2700. 2665. 2600. 2480. 2400.

*Erica Tetralix*, 2370. 2280. 2162. 2100. 2100. 2060. 2050. etc.

*Erica cinerea*, 2200. 2200. 2150. 2078. 2068. 2050. 2000? etc.

*Pteris aquilina*, 1920. 1720. 1604. 1600. 1550. 1500. 1500. etc.

*Myrica Gale*, 1700. 1617. 1550. 1490. 1350. 1346. 1307. etc.

The altitudes for many of the alpine or sub-arctic plants may perhaps be understated. The difficulties and risks of fracture, which attend the transport of delicate glass instruments among rocks and precipices, presented a serious practical impediment to their use in such situations;

while many of the alpine plants are now almost confined to the steeper precipices, in spots out of the reach of sheep. The greater number of such alpiniferous rocks, about the tract of the Grampians, range between 800 and 1000 yards of altitude; and a medium height being taken in many cases of uncertainty, the figure of 900 yards occurs frequently in the list under explanation. The *Gentiana nivalis* may afford rather an extreme example. The only spot in which it has been picked by the author of this work, was on the rocks of Canlochen glen, in Forfarshire. The top of those precipitous rocks was short of 1000 yards by measurement; and the *Gentiana* was observed much below the top. The height of 900 yards is doubtless exceeded elsewhere, as may be seen by reference to the detailed notice of the plant in volume second, page 172.

2. *Upper limits in North England.*—The arrangement here is nearly similar to that of the latter portion of the antecedent list. Condensation is sought by placing two names on the same line, and giving the altitudes and temperatures in steps of 50 yards as sectional titles. The altitudes are repeated after the technical names, and occasionally carried up to the tens instead of fifties, with a signification by place which requires to be explained. The *first* numerals after the name of a plant relate to the Lake province exclusively, that is, to the counties of Cumberland and Westmoreland taken together. The *second* numerals relate exclusively to North Yorkshire, that is, to the northern portion of the Humber province. If only a single altitudinal figure is given, the place of the absent one is indicated by three dots. Thus “1050. ...” signifies that *Carex rigida* has been seen at so many yards in the Lake province; no altitude in Yorkshire having been ascertained for it, if it occurs at all in that county. Conversely, “... 600” signifies that *Bartsia alpina* or *Carex capillaris* (page 336) has been observed at 600 yards in Yorkshire; not observed in the Lake province, or observed only at an altitude not known.

A copious list of plants, indicating the heights at which they had been noted in Yorkshire, was kindly furnished to this work by Mr. J. G. Baker; who was requested to indicate them by steps of 50 yards. Several considerations combine to render it a matter of comparatively little importance at present to seek them in more precise figures. The second figures after the names in the list are drawn exclusively from Mr. Baker's list. The heights for the Lake province were ascertained by the present writer, partly by the barometer, partly by the sympieso-

meter; partly also, they are estimates made on faith of general repute respecting the heights of certain hills and passes. The greater portion of these altitudes were ascertained in the years 1856 and 1857, by the two parties, working quite independently of each other; how far their figures would correspond or conflict, not being at all known until thus brought together in the printed list.

At the upper part of the list, it will be seen, the altitudes for the Lake province are always greater than those for the Humber, as set after the same names of plants. This difference between the provinces might lead to a false inference, if looked at without recollection that Scawfell and other hills in Cumberland attain to much higher elevation than the fells of Yorkshire. The figures for neither province can be deemed sufficiently complete and precise, to give reliable evidence whether the plants generally ascend higher in one province than in the other.

A more satisfactory inference can be drawn from a comparison between the heights for North England and those given in the antecedent list for the Grampian mountains in the middle of Scotland. At equal altitudes on these latter mountains the flora is found to be much more numerous than it is in the North of England; many of the individual species being also found to ascend to greater heights. These two facts hold good until we descend to slight altitudes,—say, below 1000 feet; where they are reversed, and the contrary becomes true. It is easy to account for this exception to a more general rule, namely, that of species ascending less high in a more northerly latitude. Like most “exceptions” to well-founded rules, it is simply an example of one or more other such rules or principles. The mountains of Scotland are much more lofty than those of England; and at or above equal altitudes the extent of surface is far greater in Scotland. The higher elevation affords suitable place and climate for various plants too alpine or arctic for the lower hills of England. Besides this difference, there are comparatively sheltered glens or ravines, and extensive surfaces of rocks almost inaccessible to sheep, situate among the Grampian mountains at altitudes where in England only bleak summits are found, of very small extent, and mostly close-cropped by flocks. In showing the number of species ascertained at or above equal heights in the two tracts of country, the subjoined table will evidence the influence of those differences on the general flora; while a comparison between the altitudes stated in the two lists, for the same individual species, will equally serve to show their usually higher ascent on the loftier hills of Scotland:—



At or above 1400 yards, 12 species in Mid Scotland.

1300	46	
1200	67	
1100	89	
1000	123	17 species in N. England.
900	205	29
800	239	76
700	272	101
600	313	165
500	352	241
400	392	320
350	455	368
300	458	511
250	476	581

The plants which find an upper limit between 250 and 350 yards in Mid Scotland, are less fully ascertained. But after making some additions on this account, those of Scotland would not count to an equality with those of England below 300 yards; although more numerous above that height.

3. *Upper limits elsewhere.*—Little explanation can be needed in regard to this short list. It is supplementary to the two preceding lists; including a few plants not noted in them, or noted only at lower altitudes, or the stated heights of which it seemed desirable to corroborate by their position elsewhere. *Sedum anglicum* and *Scilla verna* exemplify the first;—*Hymenophyllum Wilsoni* and *Ulex europæus*, the second;—*Arbutus alpina* and *Ilex Aquifolium*, the third.

It is much to be wished that some competent observer of such things would carefully trace out the altitudes of plants in Wales. Very little has yet been attempted there, and only at a season quite unsuitable for mountain botany. But in every or any part of Britain a careful repetition or re-examination is also desirable. The chief object now should be to carry forward observations on the altitudes of plants into more exact details, and with increased accuracy, throughout Britain. In first attempts there must always and unavoidably be great sacrifice of time in proportion to the results attained; the progress being very slow comparatively with that which may subsequently be achieved. For instance, both absolute and relative heights of the species are so imperfectly known by casual observation, as to be virtually unknown for purposes



of science. It will thus happen, that much time is lost in noting and calculating the heights for the same plants again and again, through successively finding them higher and higher, or (in case of the alpine) lower and lower, than the spots at which their altitudes had been before noted and calculated. Much of that troublesome repetition may now be avoided; because heights decidedly within those stated in the lists may now be disregarded unless under special circumstances; those about (above or below) the indicated limits being more especially and almost exclusively such as still require to be carefully noted. Pioneers are compelled to advance slowly and laboriously. A way once made, and landmarks fixed, their successors can get on more quickly; accomplishing more, and in less time.

## V. LOWER LIMITS OF SPECIES.

- Saxifraga cernua*, 2.10 cent. Perthshire, down to 1250 yards.  
*Saxifraga cæspitosa*, 2.20 cent. Aberdeenshire, say at 1200 yards.  
*Carex lagopina* (leporina), 2.25 cent. Aberdeenshire, rather lower.  
*Luzula arcuata*, 2.80 cent. Sutherland, say at 1000 yards.  
*Poa laxa*, 3.20 cent. Grampians, at 1000 yards, less or more.  
*Poa minor*, 3.20 cent. The same, and also uncertain.  
*Cerastium latifolium*, 3.20 cent. Grampians, at 1000 yards. Lower?  
*Draba rupestris*, 3.25 cent. Sutherland, say at 900 yards.  
*Stellaria cerastoides*, 3.50 cent. Ben Nevis, at 900 yards, near snow.  
*Saxifraga rivularis*, 3.50 cent. The same, also irrigated from snow.  
*Juncus biglumis*, 3.70 cent. Grampians, at 900 yards. Seldom so low.  
*Aira alpina*, 3.70 cent. The same. Altitude ill ascertained.  
*Cystopteris montana*, 3.70 cent. Grampians, say at 900 yards.  
*Menziesia cærulea*, 3.70 cent. Perth, about 900 yards. Single locality.  
*Carex saxatilis*, 4 cent. Easterness, rather below 850 yards.  
*Carex aquatilis*, 4 cent. Forfar, 850 yards. Different species lower?  
*Salix reticulata*, 4 cent. Rocks in Perth and Forfar, at 850 yards.  
*Erigeron alpinus*, 4 cent. The same.  
*Carex atrata*, 4 cent. The same.  
*Arenaria rubella*, 4.10 cent. Perth, at 850 or 830 yards.  
*Cherleria sedoides*, 4.10 cent. The same. If in Shetland, at 450.  
*Salix procumbens*, 4.20 cent. Grampians, at 800 yards?  
*Salix Myrsinites*, 4.20 cent. The same. Forfarshire, etc.  
*Gnaphalium norvegicum*, 4.20 cent. The same.  
*Gentiana nivalis*, 4.20 cent. The same. Among rocks.

- Salix lanata*, 4.20 cent. The same. Declivities and rocks.  
*Carex VahlII*, 4.20 cent. The same, at 800 yards by estimate.  
*Astragalus alpinus*, 4.20 cent. Aberdeen, about 800 yards.  
*Carex vaginata*, 4.20 cent. Grampians, 800 yards; but uncertain.  
*Poa cæsia*, 4.20 cent. The same. At 600 yards in Yorkshire?  
*Carex rariflora*, 4.20 cent. Grampians, at 800 yards. Low in Suthd.  
*Juncus castaneus*, 4.50 cent. Forfar, at 800 yards, or rather lower.  
*Veronica saxatilis*, 4.50 cent. Forfar, down to 750 yards on rocks?  
*Mulgedium* (or *Sonchus*) *alpinum*, 4.60 cent. The same, or lower.  
*Veronica alpina*, 4.70 cent. Grampians, at 700 yards in swamps.  
*Alopecurus alpinus*, 4.70 cent. The same.  
*Phleum alpinum*, 4.80 cent. Aberdeen, at 680 yards.  
*Oxytropis campestris*, 4.80 cent. Forfar, at 700 yards, by rude estim.  
*Myosotis alpestris*, 5 cent. North-west Yorkshire, "at 800 yards."  
*Saxifraga nivalis*, 5 cent. Forfar, at 650 yards. Seldom so low.  
*Juncus trifidus*, 5 cent. Sutherland, 550 yards. Grampians, at 650.  
*Juniperus nana*, 5 cent. Cumberland, about 800 yards.  
*Pseudathyrium alpestre*, 5 cent. Grampians, down to 600 yards.  
*Sagina saxatilis*, 5 cent. The same; but lowest limit uncertain.  
*Hieracium alpinum* (aut.), 5.10 cent. Nevis, at 620 yards. Perth, 680.  
*Salix herbacea*, 5.10 cent. Nevis, at 620 yards. Orkney, about 500.  
*Cerastium alpinum*, 5.20 cent. Aberdeen, about 600 yards. Spec. unc.  
*Azalea procumbens*, 5.25 cent. Sutherland, at 500 yards. Shetland.  
*Carex rigida*, 5.35 cent. Sutherland, at 480 yards. Shetland.  
*Sibbaldia procumbens*, 5.45 cent. Grampians, at 550 yards.  
*Luzula spicata*, 5.50 cent. Aberdeen, at 540 yards; usually 600 or 700.  
*Salix arbuscula*, 5.70 cent. Grampians, about 500 yards; but uncer.  
*Lychnis alpina*, 5.70 cent. Cumberland, at "2000 feet."  
*Poa alpina*, 5.75 cent. North-west Yorkshire, at 650 yards (Baker).  
*Betula nana*, 5.80 cent. Grampians, below 500 yards.  
*Gnaphalium supinum*, 5.90 cent. Easternness, at 460 yards.  
*Carex rupestris*, 6 cent. "Inchnadamf, Sutherland," at ...?  
*Anthericum serotinum*, 6 cent. Carnarvon, say at 700 yards.  
*Arenaria uliginosa*, 6 cent. North England, about "600 yards."  
*Epilobium alpinum*, 6 cent. Grampians, at 450 yards.  
*Saussurea alpina*, 6 cent. Sutherland, at 350 yards. Shetland.  
*Elyna* (*Kobresia*) *caricina*, 6 cent. Teesdale, at "600 yards, or lower."  
*Polygala uliginosa*, 6.25 cent. Yorkshire, at 550 yards (J. G. Baker).  
*Juncus triglumis*, 6.40 cent. Perth, 360 yards. Aberdeen, at 400.

- Bartsia alpina*, 6.50 cent. York, at 500 yards (Mr. J. G. Baker).  
*Tofieldia palustris*, 6.50 cent. Perth, at 340 or 350 yards.  
*Hieracium prenanthoides*, 6.50 cent. The same.  
*Polystichum Lonchitis*, 6.60 cent. Midwest York, at 500 yards (Tatham).  
*Woodsia ilvensis*, 6.70 cent. Dumfries at 400 yards (Rev. W. Little).  
*Arabis petræa*, 6.70 cent. By the Dee, below 300 yards (Prof. Dickie).  
*Rubus Chamæmorus*, 6.75 cent. Sutherland, about 200 yards.  
*Arenaria norvegica*, 6.75 cent. Shetland, down to "200 feet."  
*Cerastium nigrescens*, 6.75 cent. The same (Edmondston).  
*Veronica humifusa*, 6.80 cent. Denbigh, at 500 yards (Bowman).  
*Lastrea rigida*, 7.25 cent. York, at 400 yards, or lower.  
*Gentiana verna*, 7.25 cent. York or Durham, "at 350 yards."  
*Silene acaulis*, 7.35 cent. Orkney, at 50 yards (Syme). Shetland, 0.  
*Epilobium alsinifolium*, 7.40 cent. Carnarvon, at 200 yards, or lower.  
*Carex Persoonii* (vitis), 7.50 cent. York, below, 300 yards (Baker).  
*Salix lapponum*, 7.50 cent. East Lowlands, at 200 yards?  
*Nuphar pumila*, 7.50 cent. Bases of the Grampians.  
*Ajuga pyramidalis*, 7.50 cent. Sutherland, below 100 yards (Oliver).  
*Arbutus alpina*, 7.50 cent. North Sutherland, about 50 yards.  
*Alchemilla alpina*, 7.60 cent. Lakes, 350 yards. Perth, 150 yards.  
*Trientalis europæa*, 7.60 cent. Perth, below 150 yards?  
*Salix phylicifolia*, 7.75 cent. Westmoreland, at 200 or 250 yards.  
*Carex pauciflora*, 7.75 cent. North Yorkshire, at 250 yards (Baker).  
*Hierochloe borealis*, 7.75 cent. "North coast of Caithness."  
*Primula scotica*, 7.75 cent. North coast of Scotland, near sea-level.  
*Carex capillaris*, 7.75 cent. Sutherland, at the sea-level.  
*Pinguicula alpina*, 8 cent. Isle of Skye. East Ross, below 50 yards.  
*Eriocaulon septangulare*, 8 cent. Isle of Skye, etc. Altitude ...?  
*Equisetum Mackaii*, 8 cent. Aberdeen, ...? Distrib. unascertained.  
*Caltha radicans*, 8 cent. Forfar, at a low level. Aberdeen, 400 yards.  
*Pyrola uniflora*, 8 cent. Perth and Ross, at low levels.  
*Pinus sylvestris*, 8 cent. North Britain, by reduced distribution.  
*Linnæa borealis*, 8 cent. Bases of the Grampians, etc.  
*Convallaria verticillata*, 8 cent. The same, rarely. Limits unascert.  
*Orobus niger*, 8 cent. The same; also in very few spots.  
*Melampyrum sylvaticum*, 8 cent. The same, probably below 100 yards.  
*Crepis succisæfolia*, 8 cent. York, 150 yards, or lower?  
*Pyrola secunda*, 8 cent. Moray, near the level of the sea.  
*Vaccinium uliginosum*, 8 cent. North England, about 400 yards.



- Arbutus Uva-ursi*, 8 cent. West Highlands, below 50 yards.  
*Sedum villosum*, 8 cent. East Highlands, at coast-level, or nearly so.  
*Meum Athamanticum*, 8 cent. The same. Lakes, below 200 yards?  
*Potentilla alpestris*, 8 cent. North England, at 200 yards or more.  
*Thalictrum alpinum*, 8 cent. East Ross, near sea-level. Suthd., 0.  
*Circæa alpina*, 8 cent. North of Argyle, about the sea-level.  
*Salix nigricans*, 8 cent. Lowest limits not ascertained.  
*Salix laurina*, 8 cent. The same remark.  
*Galium montanum*, 8 cent. West Humber, at 200 yards?  
*Asplenium germanicum*, 8 cent. Scotland, below 200 yards?  
*Asplenium septentrionale*, 8 cent. Scotland, below 200 yards.  
*Cornus suecica*, 8 cent. North York, about 200 yards (Baker).  
*Potentilla fruticosa*, 8 cent. York, apparently about 200 yards.  
*Sesleria cærulea*, 8.10 cent. Lakes, Humber, below 200 yards.  
*Lycopodium alpinum*, 8.20 cent. Kincardine, at the coast-level?  
*Carduus heterophyllus*, 8.20 cent. Westernness, at the sea-level.  
*Galium boreale*, 8.20 cent. Aberdeen, at or near the sea-level.  
*Oxyria reniformis*, 8.20 cent. The same, by the river-side (Dickie).  
*Goodyera repens*, 8.20 cent. East Highlands, at or near the sea-level.  
*Corallorhiza innata*, 8.25 cent. Lowlands, ...? Altitude slight.  
*Potentilla rupestris*, 8.25 cent. Montgomery, "at 600 or 700 feet."  
*Juncus balticus*, 8.30 cent. Coast of Forfar.  
*Polygonum viviparum*, 8.30. cent. E. Highlands, 0. Fife, below 50?  
*Saxifraga stellaris*, 8.50 cent. North Wales, at 150 yards (Bowman).  
*Lycopodium annotinum*, 8.50 cent. Charnwood, at ...? Mull, 8.10 c.  
*Carex incurva*, 8.50 cent. Shore of the Forth? Forfar shore.  
*Juncus filiformis*, 8.50 cent. Windermere, Westmoreland.  
*Equisetum umbrosum*, 8.50 cent. Descends to the coast-levels?  
*Cypripedium Calceolus*, 8.50 cent. Nearly the same?  
*Primula farinosa*, 8.50 cent. York, at a slight altitude.  
*Lysimachia thyrsoiflora*, 8.50 cent. Scotland, at or near the coast-level.  
*Actæa spicata*, 8.50 cent. York, at 100 yards or lower (Baker).  
*Carex irrigua*, 8.50 cent. Lowlands. North of England.  
*Thlaspi alpestre*, 8.50 cent. Derbyshire, below 200 yards.  
*Draba muralis*, 8.50 cent. The same. Somerset, perhaps 9 cent.  
*Polemonium cæruleum*, 8.50 cent. The same. Tyne, at 150 yards?  
*Lychnis Viscaria*, 8.60 cent. Radnor, ...? Lowlands, at 50 or 100.  
*Saxifraga oppositifolia*, 8.60 cent. Cantyre, 0. North Aberdeen, 0.  
*Draba incana*, 8.60 cent. Islay, 0. East Ross, 15 yards.



- Saxifraga aizoides*, 8.60 cent.      Ayr, on coast-rocks.  
*Sedum Rhodiola*, 8.60 cent.      Lowlands, east and west, on same.  
*Ligusticum scoticum*, 8.60 cent.      Northumberland. Ayr.  
*Rumex aquaticus*, 8.60 cent.      Lowlands. North England.  
*Potamogeton gracilis*, 8.60 cent.      Northumberland. Dubious species.  
*Allium Scorodoprasum*, 8.70 cent.      Tyne, about the coast-level.  
*Thalictrum majus* (Sm.), 8.70 cent.      The same. Lakes, 75 yards.  
*Oxytropis uralensis*, 8.80 cent.      Coast of Wigton. Fife, say 8.25 cent.  
*Isoetes lacustris*, 8.80 cent.      Lake province, nearly to coast-level.  
*Allosorus crispus*, 8.80 cent.      North Wales, 150 or 100 yards.  
*Asplenium viride*, 9 cent.      Low in the Severn province  
*Empetrum nigrum*, 9 cent.      East York, at the coast-level.  
*Vaccinium Vitis-idaea*, 9 cent.      Cheshire, about 50 yards.  
*Saxifraga Hirculus*, 9 cent.      Cheshire, at ... ?  
*Salix acutifolia*, 9 cent.      North-east Yorkshire, at ... ?  
*Carex paradoxa*, 9 cent.      Vale of York, at 20 or 30 yards ?  
*Arundo stricta*, 9 cent.      Cheshire, at ... ?  
*Rubus saxatilis*, 9 cent.      Highest temperature not ascertained.  
*Rubus suberectus*, 9 cent.      Wales, at a low altitude.  
*Crepis paludosa*, 9 cent.      North England, about the sea-level.  
*Arabis ciliata*, 9 cent.      South Wales only ? Altitude ... ?  
*Listera cordata*, 9 cent.      York, at 15 or 20 yards. Devon, 150 or 200.  
*Carum Carui*, 9.20 cent.      Near Hull, by old records.  
*Lycopodium selaginoides*, 9.20 cent.      Lancashire coast, at tide-level.  
*Erythræa latifolia*, 9.20 cent.      The same. Doubtful elsewhere.  
*Subularia aquatica*, 9.25 cent.      Anglesea, at slight altitude ?  
*Impatiens Noli-me-tangere*, 9.25.      Wales. Is 9.25 too high ?  
*Saxifraga hypnoides*, 9.25 cent.      Somerset, at 100 or 150 yards (Clark).  
*Blysmus rufus*, 9.30 cent.      Coast of Anglesea.  
*Mertensia maritima* (no. 858), 9.30 cent.      The same.  
*Callitriche autumnalis*, 9.30 cent.      Anglesea. (Good species).  
*Lobelia Dortmanna*, 9.50 cent.      Salop, Glamorgan, at ... ?  
*Vicia Orobus*, 9.50 cent.      Carmarthen ; altitude also unknown.  
*Trollius europæus*, 9.50 cent.      Wales, at or near the coast-level.  
*Viola lutea*, 9.50 cent.      Pembroke, near the coast-level.  
*Hymenophyllum Wilsoni*, 9.50 cent.      Cornwall, on a hill of 700 feet.  
*Symphytum tuberosum*, 9.50 cent.      Ouse (and Thames ?) at low alt.  
*Lamium intermedium* ... cent.      South limit not ascertained.

*Explanations relating to the Lower Limits.*—The lower limits of plants are more variable, and are less readily determined than the upper limits; those of one species comparatively with, or relatively to, those of another. With decreasing height the surface to be examined becomes wider and more diversified. The modifying influences of maritime proximity, of shelter and exposure, of character or configuration of surface, of agricultural and other human operations, seem all to act with increasing force on the lowest limits of plants. Those limits are in consequence more difficult to determine, and seem less clear or satisfactory when brought into a series arranged on paper. A first attempt at such an arrangement was printed in the first volume of the 'London Journal of Botany,' pages 241 to 253; but restricted to the plants of the Grampian mountains. The more extended series above given is founded on the same notes and observations, with many additions since made; but the localities are here reduced to one or two for each species, in order not to exceed a single line.

The names are placed in series according to the supposed temperature of the lowest spots, relatively to the latitude, at which the species have been noted; the altitudes being represented by centigrade temperature, in accordance with the scales given on pages 164, 165 of this volume. The indication of temperature may thus be said to show the highest (warmest) climate which the plant appears adapted to sustain, so far as its places of growth in Britain may suffice to show this. But such climatal indications can pretend only to be approximations, more or less close for each plant. The lower is the name in the list, the less certain is its position, as a general rule. The first locality or altitude stated for each species, is the one with which the stated temperature is supposed to correspond; and it as at present the lowest ascertained, relatively to latitude and temperature. For instance, *Draba incana* being found at the sea-level in Islay, southward of latitude 56, where the sea-level temperature should exceed 8.50 centigrade, it is placed below *Alchemilla alpina*; this latter not having been noted anywhere exactly on the shore or sea-level, and probably not existing below 100 yards anywhere to the southward of latitude 56.

The succession of names in the list thus constitutes a climatal series, chiefly determined by altitude, and in so far representing simple altitude; but this latter condition being also read in relation to latitude; and not absolutely, unless under equal latitude. As a general rule, always liable to various exceptions in its local applications, plants may

be deemed to succeed each other in climate and position similarly with the succession of their names in the above list. If we trace downwards from the higher hills and more northerly provinces, towards the low or flat country of the south-eastern provinces of England, we lose the plants nearly in the order or series of their names. Conversely, we may meet with them nearly in accordance with the same series reversed, as we pass from the low south-eastern provinces into the more boreal and more mountainous provinces. But in no single province or division can the same series be found. The plants themselves do not all occur in any one province or larger division of Britain; and in each separate division or province some variations will appear in the succession of those which do occur there. Moreover, progressive knowledge will doubtless induce changes and corrections in the relative position or series of the names as now printed. The list is restricted to those plants not marked "1" in the 'Summary of Distribution,' that is, not certainly descending into the inferagrarian zone. The *Hieracia* are mostly omitted; the statements about their lower limits, in the Monograph by Mr. Backhouse, being found too incomplete and uncertain for use in this manner.

Possibly the short list of lower limits may prove a sort of *Pons asinorum* with beginners. If more advanced botanists should find any difficulty in understanding it, they are requested to read carefully the lower halves of pages 164, 165, and the upper half of page 166. If they should then still fail to understand the list, they are respectfully recommended not to trouble themselves about phyto-geography.

## IX. CENSUS OR SUMMARIES OF ORDERS.

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N.B. Comparisons would be found less convenient among the orders in any one of the annexed lists, if they should be set in a fragmentary manner over more pages than actually required by the number of lines. On this account the explanations will not be appended to each in turn, but be given collectively after the last of them.



## I. COLLECTIVE CENSUS OF ORDERS.

	Spec.	Perc.	Census.	Aver.	Europe.	V. K.
1 Compositæ	135	9.47	5600	41	1401	9000
2 Gramina	112	7.87	5007	44	554	3800
3 Cyperoides	93	6.52	3402	36	255	2000
4 Rosacæ	82	5.75	2714	33	272	1000
5 Leguminiferæ	70	4.91	2850	40	852	6500
6 Cruciferæ	60	4.21	2156	36	579	1600
7 Umbelliferæ	57	4.00	2383	42	495	1500
8 Caryophyllacæ	57	4.00	2338	41	493	1070
9 Scrophulariacæ	48	3.36	2211	46	381	1814
10 Lamiacæ	47	3.29	2366	50	411	2350
11 Filices	39	2.73	1795	46	71	2040
12 Orchidacæ	39	2.73	1251	32	111	3000
13 Ranunculacæ	35	2.45	1654	47	277	1000
14 Amentiferæ	34	2.38	1239	36	130	570
15 Polygonacæ	26	1.82	1353	52	74	490
16 Juncacæ	26	1.82	1200	46	58	200
17 Chenopodiaceæ	24	1.68	796	33	114	360
18 Potamaceæ	22	1.54	727	33	40	60
19 Boraginacæ	21	1.47	923	44	204	600
20 Liliacæ	21	1.47	450	21	256	1200
21 Ericacæ	20	1.40	667	33	52	1080
22 Rubiacæ	18	1.26	869	48	170	320
23 Primulacæ	17	1.19	814	48	93	215
24 Geraniacæ	14	.98	758	53	68	500
25 Euphorbiacæ	14	.98	478	34	124	2500
26 Gentianacæ	14	.98	474	34	70	550
27 Saxifragacæ	14	.98	449	32	109	310
28 Campanulacæ	14	.98	440	21	162	875
29 Onagrææ	13	.91	626	48	27	450
30 Crassulacæ	11	.77	330	30	97	450
31 Hypericacæ	10	.70	592	59	52	276
32 Violacæ	10	.70	446	44	137	300
33 Orobanchacæ	10	.70	164	16	108	116
34 Equisetacæ	9	.63	442	49	13	10
35 Alismacæ	9	.63	414	46	15	60
36 Papaveracæ	7	.49	376	54	25	130



	Spec.	Perc.	Census.	Aver.	Europe.	V. K.
37 Plantaginaceæ	6	.42	466	78	37	120
38 Caprifoliaceæ	6	.42	326	55	24	220
39 Typhaceæ	6	.42	314	52	15	13
40 Lycopodiaceæ	6	.42	261	43	10	200
41 Fumariaceæ	6	.42	258	43	33	100
42 Pinguiculaceæ	6	.42	206	34	11	175
43 Plumbaginaceæ	6	.42	126	21	100	160
44 Illecebraceæ	6	.42	89	14	41	100
45 Dipsaceæ	5	.35	328	66	86	150
46 Valerianaceæ	5	.35	301	60	54	85
47 Malvaceæ	5	.35	245	49	62	1000
48 Iridaceæ	5	.35	142	28	87	550
49 Urticaceæ	4	.28	309	77	24	300
50 Solanaceæ	4	.28	229	57	46	900
51 Pistiaceæ	4	.28	200	50	5	20
52 Haloragiaceæ	4	.28	189	47	5	70
53 Linaceæ	4	.28	188	47	38	90
54 Callitrichaceæ	4	.28	169	42	5	6
55 Coniferæ	4	.28	112	28	41	150
56 Grossulariaceæ	4	.28	110	27	7	95
57 Cistaceæ	4	.28	79	10	81	185
58 Convolvulaceæ	3	.21	170	57	31	660
59 Droseraceæ	3	.21	154	51	5	90
60 Lythraceæ	3	.21	148	49	16	300
61 Nymphaeaceæ	3	.21	131	44	11	50
62 Melanthiaceæ	3	.21	123	41	29	130
63 Polygalaceæ	3	.21	98	33	23	495
64 Cuscutaceæ	3	.21	59	20	49	50
65 Araliaceæ	2	.21	159	78	3	160
66 Jasminaceæ	2	.14	132	66	20	230
67 Resedaceæ	2	.14	131	65	20	41
68 Rhamnaceæ	2	.14	92	46	22	250
69 Araceæ	2	.14	86	43	20	240
70 Ulmaceæ	2	.14	73	36	6	60
71 Cornaceæ	2	.14	65	32	4	40
72 Marsileaceæ	2	.14	58	29	9	24
73 Thymeleaceæ	2	.14	57	28	31	300
74 Hydrocharidaceæ	2	.14	50	25	6	20

	Spec.	Perc.	Census.	Aver.	Europe.	V. K.
75 Amaryllidaceæ	2	.14	49	24	69	400
76 Zosteraceæ	2	.14	49	24	4	12
77 Ceratophyllaceæ	2	.14	44	22	3	6
78 Elatinaceæ	2	.14	16	8	8	22
79 Oxalidaceæ	1	.07	84	84	4	325
80 Portulacaceæ	1	.07	80	80	2	184
81 Illicaceæ	1	.07	72	72	2	110
82 Tamaceæ	1	.07	63	63	1	110
83 Celastraceæ	1	.07	62	62	5	260
84 Trilliaceæ	1	.07	59	59	1	30
85 Verbenaceæ	1	.07	56	56	4	610
86 Empetraceæ	1	.07	54	54	2	4
87 Cucurbitaceæ	1	.07	50	50	8	270
88 Aceraceæ	1	.07	50	50	8	60
89 Loranthaceæ	1	.07	33	33	5	412
90 Berberaceæ	1	.07	30	30	7	100
91 Tiliaceæ	1	.07	19	19	4	350
92 Santalaceæ	1	.07	19	19	15	110
93 Apocynaceæ	1	.07	18	18	6	566
94 Frankeniaceæ	1	.07	11	11	6	24
95 Balsaminaceæ	1	.07	6	6	1	110
96 Asaraceæ	1	.07	6	6	17	130
97 Eleagnaceæ	1	.07	5	5	2	30
98 Restiaceæ	1	.07	2	2	1	471

	Britain.	Census.	Aver.	Europe.	V. K.
Total species	1,425	58,124	41	9,677	82,714
Dicotyledons	1,018	41,980	41	8,030	66,488
Monocotyledons	352	13,588	39	1,544	13,952
Ferns, etc.	55	2,556	46	103	2,274

	Britain.	Europe.	V. K.
Dicotyledons, per centage	71.43	82.98	80.38
Monocotyledons „	24.70	15.95	16.86
Ferns, etc. „	3.85	1.06	2.75

## II. DISTRIBUTIVE CENSUS OF ORDERS.

	B.	W.	E.	S.	M.	N.	C.	A.	U.
1 Compositæ	135	113	133	108	103	102	111	73	35
2 Gramina	112	102	108	104	85	79	104	58	20
3 Cyperoides	93	83	88	80	76	71	81	43	29
4 Rosaceæ	82	80	74	75	70	41	77	38	12
5 Leguminiferæ	70	62	65	66	51	41	67	24	6
6 Cruciferæ	60	58	54	57	48	36	58	25	9
7 Umbelliferæ	57	53	53	55	47	31	57	18	2
8 Caryophyllaceæ	57	51	54	47	46	46	48	26	15
9 Scrophulariaceæ	48	43	46	44	36	27	44	21	11
10 Lamiaceæ	47	43	46	45	39	32	47	19	2
11 Filices	39	38	38	36	36	33	33	30	17
12 Orchidaceæ	39	30	37	36	27	17	39	16	3
13 Ranunculaceæ	35	33	34	32	29	19	35	21	9
14 Amentiferæ	34	32	34	23	29	30	26	20	8
15 Polygonaceæ	26	25	26	25	24	18	26	15	3
16 Juncaceæ	26	25	26	20	20	22	20	15	13
17 Chenopodiaceæ	24	21	24	24	20	12	24	4	-
18 Potamaceæ	22	19	22	21	20	16	22	6	-
19 Boraginaceæ	21	20	21	20	18	17	20	11	1
20 Liliaceæ	21	19	18	19	13	9	19	8	?
21 Ericaceæ	20	19	18	13	14	18	17	14	13
22 Rubiaceæ	18	15	18	17	16	11	17	11	2
23 Primulaceæ	17	16	16	13	15	12	17	7	2
24 Geraniaceæ	14	14	13	14	12	10	14	9	1
25 Euphorbiaceæ	14	13	12	14	9	4	14	4	-
26 Gentianaceæ	14	13	13	11	11	6	12	5	3
27 Saxifragaceæ	14	12	14	9	11	13	10	10	11
28 Campanulaceæ	14	13	13	14	10	7	14	5	1
29 Onagraceæ	13	12	13	12	10	11	11	9	2
30 Crassulaceæ	11	11	8	10	8	6	10	8	2
31 Hypericum	10	10	9	10	9	7	10	8	1
32 Viola	10	10	10	10	8	6	10	6	3
33 Orobanchaceæ	10	9	9	10	5	2	10	1	-
34 Equisetum	9	8	9	7	8	9	9	6	2
35 Alismaceæ	9	9	9	9	9	5	9	1	1
36 Papaveraceæ	7	7	7	7	7	4	7	4	-

	B.	W.	E.	S.	M.	N.	C.	A.	U.
37 Plantaginaceæ	6	6	6	6	6	6	6	6	-
38 Caprifoliaceæ	6	6	6	5	6	3	6	4	1
39 Typhaceæ	6	6	6	6	6	6	6	3	-
40 Lycopodium	6	6	6	6	6	6	6	6	4
41 Fumariaceæ	6	4	6	6	5	4	6	2	-
42 Pinguiculaceæ	6	6	5	5	4	6	6	4	1
43 Plumbaginaceæ	6	5	6	6	5	1	6	1	1
44 Illecebraceæ	6	6	3	6	2	1	6	1	-
45 Dipsaceæ	5	5	5	5	5	4	5	3	1
46 Valerianaceæ	5	5	5	5	5	5	5	2	1
47 Malvaceæ	5	5	4	5	5	3	5	2	-
48 Iridaceæ	5	4	4	4	3	1	4	-	-
49 Urticaceæ	4	4	4	4	4	3	4	4	1
50 Solanaceæ	4	4	4	4	4	2	4	2	-
51 Lemna	4	4	4	4	4	2	4	1	-
52 Haloragiaceæ	4	4	4	4	4	3	4	3	-
53 Linaceæ	4	3	4	4	4	2	4	2	1
54 Callitriche	4	4	4	4	4	4	4	3	1
55 Conifera	4	4	4	3	3	3	3	4	3
56 Ribes	4	4	4	3	4	2	4	3	-
57 Helianthemum	4	4	2	4	2	1	4	2	-
58 Convolvulus	3	3	3	3	3	3	3	-	-
59 Drosera	3	3	3	3	3	3	3	2	-
60 Lythraceæ	3	2	3	3	2	2	3	1	-
61 Nymphæaceæ	3	3	3	2	2	3	3	3	-
62 Melanthiaceæ	3	3	3	2	3	2	2	2	2
63 Polygala	3	2	3	2	2	1	2	2	1
64 Cuscuta	3	3	3	3	3	-	3	-	-
65 Araliaceæ	2	2	2	2	2	2	2	2	1
66 Jasminaceæ	2	2	2	2	2	1	2	1	-
67 Reseda	2	2	2	2	2	2	2	-	-
68 Rhamnus	2	2	2	2	2	-	2	1	-
69 Araceæ	2	2	2	2	2	-	2	2	-
70 Ulmus	2	2	2	2	2	1	2	1	-
71 Cornus	2	2	2	1	2	1	2	2	1
72 Marsileaceæ	2	2	2	2	2	2	2	2	-
73 Daphne	2	2	2	2	2	-	2	1	-
74 Hydrocharidaceæ	2	2	2	2	2	-	2	-	-



	B.	W.	E.	S.	M.	N.	C.	A.	U.
75 Amaryllidaceæ	2	2	2	2	1	-	2	-	-
76 Zostera	2	2	2	2	2	1	2	-	-
77 Ceratophyllum	2	2	2	2	2	1	2	-	-
78 Elatine	2	2	2	2	1	1	2	-	-
79 Oxalis	1	1	1	1	1	1	1	1	1
80 Montia	1	1	1	1	1	1	1	1	1
81 Ilex	1	1	1	1	1	1	1	1	-
82 Tamus	1	1	1	1	1	-	1	-	-
83 Euonymus	1	1	1	1	1	-	1	-	-
84 Paris	1	1	1	1	1	1	1	-	-
85 Verbena	1	1	1	1	1	1	1	-	-
86 Empetrum	1	1	1	1	1	1	1	1	1
87 Bryonia	1	1	1	1	1	-	1	-	-
88 Acer	1	1	1	1	1	-	1	1	-
89 Viscum	1	1	1	1	1	-	1	-	-
90 Berberis	1	1	1	1	1	-	1	-	-
91 Tilia	1	1	1	1	1	-	1	-	-
92 Thesium	1	1	1	1	-	-	1	-	-
93 Vinca	1	1	1	1	-	-	1	-	-
94 Frankenia	1	-	1	1	-	-	1	-	-
95 Impatiens	1	1	-	1	1	-	1	-	-
96 Asarum	1	1	1	1	1	-	1	-	-
97 Hippophae	1	-	1	1	1	-	1	-	-
98 Eriocaulon	1	1	-	-	-	1	1	-	-

	Brit.	West.	East.	Sou.	Mid.	Nor.	Coa.	Asc.	Up.
Total species	1425	1305	1355	1280	1148	930	1319	687	262
Dicotyledons	1018	936	965	914	822	647	957	486	170
Monocotyledons	352	315	335	315	274	233	312	157	68
Ferns, etc.	55	54	55	51	52	50	50	44	24

	South.	Mid.	North.	Coast.	Ascend.	Upper.
Dicotyledons, per cent.	71.40	71.60	69.57	72.55	70.74	64.88
Monocotyledons „	24.60	23.86	25.05	23.65	22.85	25.95
Ferns, etc. „	3.98	4.52	5.37	3.79	6.40	9.16

## III. CLIMATAL CENSUS OF ORDERS.

	Br.	Agr.	Arc.	Agrarian zones.			Arctic zones.		
1 Compositæ	135	116	45	102	87	70	33	32	14
2 Gramina	112	105	27	102	83	64	21	18	11
3 Cyperoides	93	84	33	77	68	62	25	28	8
4 Rosaceæ	82	81	18	72	63	36	18	12	5
5 Leguminiferæ	70	68	12	65	46	32	10	7	-
6 Cruciferæ	60	59	10	54	45	32	9	9	5
7 Umbelliferæ	57	57	3	54	43	23	3	2	-
8 Caryophyllaceæ	57	47	20	45	41	33	14	15	11
9 Scrophulariaceæ	48	44	15	43	36	20	12	10	4
10 Lamiaceæ	47	47	4	45	41	25	4	1	1
11 Filices	39	36	21	29	33	30	20	15	7
12 Orchidaceæ	39	39	5	35	27	17	5	3	-
13 Ranunculaceæ	35	35	10	30	29	19	10	8	3
14 Amentiferæ	34	27	15	22	25	18	10	11	2
15 Polygonaceæ	26	26	4	23	21	17	4	4	3
16 Juncaceæ	26	25	13	18	18	16	9	10	7
17 Chenopodiaceæ	24	24	-	24	20	10	-	-	-
18 Potamaceæ	22	22	1	21	20	14	1	-	-
19 Boraginaceæ	21	20	2	19	17	12	1	1	1
20 Liliaceæ	21	20	1	18	12	6	1	-	-
21 Ericaceæ	20	18	14	12	11	16	12	11	5
22 Rubiaceæ	18	18	4	16	15	11	4	2	1
23 Primulaceæ	17	17	3	13	14	11	3	2	-
24 Geraniaceæ	14	14	2	14	12	9	2	1	-
25 Euphorbiaceæ	14	14	1	14	8	3	1	-	-
26 Gentianaceæ	14	13	5	10	10	6	4	2	1
27 Saxifragaceæ	14	10	11	6	8	10	7	8	9
28 Campanulaceæ	14	14	2	14	10	4	2	1	1
29 Onagraceæ	13	12	6	10	9	8	6	3	1
30 Crassulaceæ	11	11	3	9	8	6	3	2	1
31 Hypericum	10	10	1	10	9	8	1	-	-
32 Viola	10	10	3	9	7	5	3	3	1
33 Orobanchaceæ	10	10	-	10	5	1	-	-	-
34 Equisetum	9	9	3	7	8	8	3	2	-
35 Alismaceæ	9	9	1	9	8	4	1	1	-
36 Papaveraceæ	7	7	1	7	7	4	1	-	-

	Br.	Agr.	Arç.	Agrarian zones.			Arctic zones.		
37 Plantaginaceæ	6	6	2	6	6	6	2	-	-
38 Caprifoliaceæ	6	6	1	5	6	4	1	1	-
39 Typhaceæ	6	6	-	6	6	5	-	-	-
40 Lycopodium	6	6	5	3	4	6	5	4	3
41 Fumariaceæ	6	6	-	6	6	4	-	-	-
42 Pingulaceæ	6	6	1	5	5	6	1	1	-
43 Plumbaginaceæ	6	6	1	6	5	1	1	1	1
44 Illecebraceæ	6	6	-	6	1	1	-	-	-
45 Dipsaceæ	5	5	1	5	5	3	1	1	-
46 Valerianaceæ	5	5	1	5	5	4	1	-	-
47 Malvaceæ	5	5	-	5	5	2	-	-	-
48 Iridaceæ	5	5	-	5	3	1	-	-	-
49 Urticaceæ	4	4	1	4	4	3	1	1	-
50 Solanaceæ	4	4	-	4	4	2	-	-	-
51 Lemna	4	4	-	4	4	1	-	-	-
52 Haloragiaceæ	4	4	-	4	3	3	-	-	-
53 Linaceæ	4	4	1	4	4	2	1	1	-
54 Callitriche	4	4	1	3	4	4	1	-	-
55 Coniferae	4	3	3	2	2	3	3	2	-
56 Ribes	4	4	-	4	4	2	-	-	-
57 Helianthemum	4	4	1	4	2	2	1	-	-
58 Convolvulus	3	3	-	3	3	1	-	-	-
59 Drosera	3	3	2	3	3	3	2	-	-
60 Lythraceæ	3	3	-	3	3	1	-	-	-
61 Nymphaeaceæ	3	3	-	2	2	3	-	-	-
62 Melanthiaceæ	3	3	2	2	2	2	2	2	1
63 Polygala	3	3	1	2	1	2	1	1	-
64 Cuscuta	3	3	-	3	3	-	-	-	-
65 Araliaceæ	2	2	1	2	2	2	1	1	1
66 Jasminaceæ	2	2	-	2	2	1	-	-	-
67 Reseda	2	2	-	2	2	1	-	-	-
68 Rhamnus	2	2	-	2	2	-	-	-	-
69 Araceæ	2	2	-	2	2	-	-	-	-
70 Ulmus	2	2	-	2	2	1	-	-	-
71 Cornus	2	2	1	1	1	1	1	1	-
72 Marsileaceæ	2	2	1	1	2	2	1	-	-
73 Daphne	2	2	-	2	2	-	-	-	-
74 Hydrocharidaceæ	2	2	-	2	2	-	-	-	-

	Br. Agr. Arc.			Agrarian zones			Arctic zones.		
75 Amaryllidaceæ	2	2	-	2	1	-	-	-	-
76 Zostera	2	2	-	2	2	1	-	-	-
77 Ceratophyllum	2	2	-	2	2	1	-	-	-
78 Elatine	2	2	-	2	1	1	-	-	-
79 Oxalis	1	1	1	1	1	1	1	1	1
80 Montia	1	1	1	1	1	1	1	1	1
81 Ilex	1	1	-	1	1	1	-	-	-
82 Tamus	1	1	-	1	1	-	-	-	-
83 Euonymus	1	1	-	1	1	-	-	-	-
84 Paris	1	1	-	1	1	1	-	-	-
85 Verbena	1	1	-	1	1	-	-	-	-
86 Empetrum	1	1	1	-	1	1	1	1	1
87 Bryonia	1	1	-	1	1	-	-	-	-
88 Acer	1	1	-	1	1	-	-	-	-
89 Viscum	1	1	-	1	1	-	-	-	-
90 Berberis	1	1	-	1	1	-	-	-	-
91 Tilia	1	1	-	1	1	-	-	-	-
92 Thesium	1	1	-	1	-	-	-	-	-
93 Vinca	1	1	-	1	-	-	-	-	-
94 Frankenia	1	1	-	1	-	-	-	-	-
95 Impatiens	1	1	-	-	1	-	-	-	-
96 Asarum	1	1	-	1	1	-	-	-	-
97 Hippophae	1	1	-	1	1	-	-	-	-
98 Eriocaulon	1	1	-	-	-	1	-	-	-

	Agr. Arc.		Agrarian zones.			Arctic zones.		
Total species	1250	349	1225	1070	764	293	244	111
Dicotyledons	864	236	878	765	523	199	161	74
Monocotyledons	333	83	307	258	195	65	62	27
Ferns, etc.	53	30	40	47	46	29	21	10

## IV. EXPLANATIONS OF THE ORDINAL SUMMARIES..

1. *Collective Census*.—This designation is given to the first series of orders because the flora is there regarded as a whole or total, without reference to its local changes. The names of the orders are placed in sequence according to the number of species for each of them, as given by the 'Summary of Distribution,' and repeated in the column of figures which *first* follows the names. The number of species being equal for



two or more orders, the sequence of their names is then determined by the figures set in the third column. The *second* column of figures shows the per-centage of the several orders in the whole flora ; thus, *Compositæ* count nearly to nine and a half in the hundred species ; *Umbelliferae* make up four in the hundred ; *Geraniaceæ*, and all others placed below that order, being only a fraction per cent.

The *third* column of figures repeats the census of the orders, as before introduced into the 'Summary,' and explained on pages 231 and 232. It is the sum total of the comital (always including the vice-comital) numbers placed immediately before the several names in the 'Census of Species,' pages 234 to 271, re-arranged into orders. The total of counties for each order being divided by the number of its species, an average of frequency or diffusion is ascertained for those of each order, as shown by the *fourth* column of figures. But it will readily be understood, that the species become too few in the lower portion of the series, to yield averages suitable for comparison with those of orders much higher in the series. And in comparing the averages one with another, due allowance must be made for any artificial peculiarity of the order which may alter its proper average ; for instance, that of *Rosaceæ* is doubtless reduced too low by the numerous segregate species of *Rubus*, the comital distribution of which is less fully ascertained, than that of other more true or more understood species. Doubtless, also, the segregate species of *Hieracium*, many of them recorded from very few counties, somewhat reduce the average for the *Compositæ*. Although liable thus to some irregularities, the comital census and averages serve usefully to correct false ideas which might otherwise be suggested by the number of species in an order, if alone regarded as a measure of its predominance in the vegetation of the island. For example, the orders *Filices* and *Orchidaceæ* may be cited as on equality in the numbers of their species ; but on looking to the comital census or average frequency of the species, we find the ferns thus proved to prevail much more than the orchids. The comital average for the order *Filices* is 46, or five above the general average of 41 ; that for the order *Orchidaceæ* being only 32, or nine below the general average. These two orders are very suitable for the comparative illustration ; having no introduced species included with them, and both being botanical favourites, much looked for, and their localities usually recorded.

The *fifth* and *sixth* columns are introduced for comparison with the first. They show the numbers of species for the same orders in Europe

generally, and in the vegetable kingdom at large. Nyman's 'Sylloge Floræ Europææ' has supplied the requisite data for the fifth column; those for the sixth column being derived from Lindley's 'Vegetable Kingdom.' The numbers are doubtless very incomplete for the earth generally; but the statements and guesses about them, as set forth in the latter work, are probably the best yet placed on record in any single treatise. The absolute numbers are perhaps false in every instance; and if regarded as approximate calculations or estimates they are certainly of unequal truth; and so far they can give only imperfect comparisons. An enumeration of the orders, placed in a series according to the number of British species they include, may well enough represent their comparative share in constituting the flora of this island. But by itself it would of course fail to show by what ordinal peculiarities the flora of Britain is distinguished from that of the earth generally, or of Europe, or of any given country. And in seeking to know the phyto-geographical features of Britain itself, we should ascertain wherein they differ from the floral physiognomy elsewhere.

2. *Distributive Census*.—This designation is given to the repetition of the orders in a second series because their numerical values are there stated for eight different divisions of the island, not as one collective whole. Thus stated, they become data for comparing the botany of one portion of Britain with another, or that of the whole with its parts. In repeating the series, a change has been made from the ordinal to the generic name, in those orders having only a single genus to represent them in Britain. Three treble columns of figures succeed the list of names. The *first* column states the number of species in each order for total Britain, and for its western and eastern divisions, before explained on pages 136 to 139. The *second* column states the numbers for the southern, middle, and northern divisions of the island, also before explained on pages 134 to 136. The *third* column states the numbers for the three ascending stages of elevation, as they were explained on page 230. The numbers are counted from the 'Summary of Distribution,' with some half-dozen alterations and corrections.

The series of ordinal and generic names might be re-arranged in accordance with the predominating figures in any of the columns; and when so re-arranged they would of course represent the botany of the corresponding division of the island, regarded from the systematic point of view. The series for the eastern and western divisions would continue

nearly the same as that for total Britain, under any such numerical re-arrangement; some of the slight changes made being attributable to incomplete knowledge or to arbitrary distinctions by botanists, rather than to true natural differences. *Filices* and *Orchidaceæ* would afford true examples of difference. The former order has equal numbers on the two sides of the island; which is a relative predominance on the western side, on account of the total western flora being rather smaller than the eastern. The orchids decidedly predominate on the eastern side of Britain, through the existence of several local species in the south-eastern provinces of England, which do not extend into the western division; and the order would thus take a position relatively higher in the one division than in the other.

Considerably wider changes would be induced by a re-arrangement of the orders according to the numbers stated in the second column. For example, the numbers of *Caryophyllaceæ* and *Juncaceæ* run nearly uniform through the three latitudinal divisions; thus having a relative increase in the northern division; and the latter even an absolute increase in that division, which has a considerably less numerous total flora. On the contrary, *Gramina* lose nearly one-fourth, and *Leguminifera* more than one-third of their numbers in the same direction; the full difference between the floras of the southern and northern divisions being something more than a third less in the north. Such changes would become much greater in a re-arrangement of the orders for the three ascending stages of altitude. *Saxifragaceæ* would rise to be the tenth order in the series for the uppermost stage; while it would sink in the lowest stage somewhat lower than its position in the series for total Britain. Some orders, not very scanty in species, quite disappear in the uppermost stage; for instance, *Chenopodiaceæ* and *Euphorbiaceæ*.

3. *Climatal Census*.—The six ascending or climatal zones, constituting the agrarian and arctic regions, were explained at some length in volume first, pages 19 to 43, and illustrated more specially on pages 40 and 41. In the *first* of the three treble columns of this census, the numbers for Britain generally are set against those for the agrarian and arctic regions, apart from each other. In the *second* and *third* columns, the numbers are given for the six zones, three agrarian and three arctic zones. In the second tabular series or census of orders, the apparent influence of latitude was partially modified by that of altitude; and in like manner the influence of elevation was altered somewhat by that of



latitude. Each condition, latitude and altitude, was there regarded by itself, without consideration of the other. In this manner *Ulex europæus* and *Azalea procumbens* got placed under the same divisions of latitude and of elevation, the northern and the ascending, although in fact they do not belong to the same climatal flora. The *Ulex* ascends above 700 yards in Wales, and the *Azalea* descends below the same height in North Britain; thus actually growing on the same level of altitude, if the scope of view takes in the whole of Britain; although not anywhere meeting on the same level of height under the same degree of latitude. In the third series of orders, now under explanation, this and various other similar anomalies disappear; through combining the plants of higher levels in more southern latitudes, with those of lower levels in more northern latitudes. In so far, the two regions or six zones supply more suitable data for tracing the influence of climate, in varying the proportions between the groups of systematic botany, than would be supplied by zones of latitude or altitude, if regarded by themselves only, and not in modifying connexion with each other. Zones of latitude might suffice equally well or better, if they could be traced across a country of nearly the same unvaried elevation. Or, zones of altitude might well suffice for climate also, if traced on a single mountain or group of mountains, whose base covered only a small horizontal area of latitude and longitude.

A cursory glance over the figures in this climatal series, will show that wide floral differences can be traced between the two regions and the six zones. From the agrarian to the arctic region, from the lower to the upper zones, there is a general decrease in the flora, and of course a corresponding average decrease in the orders. This decrease is attributable partly to the decreasing area, as will presently become apparent, and partly to the deteriorating climate. But it will be observed that the ordinal decrease is extremely unequal and disproportionate, when the orders are compared one with another. For example, *Leguminiferae* exceed *Cruciferae* by one-sixth in the general flora of Britain; and nearly the same disproportion is observable in the floras severally of the agrarian region or lower agrarian zone. In the upper agrarian zone the numbers become equalised; while above the lower arctic zone the *Cruciferae* predominate even in absolute numbers; thus reversing the relative proportions of the lowest zone.



## X. GENERAL REMARKS.

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### 1. *Phyto-geographical Definitions.*

PHYTO-GEOGRAPHY traces out the history and distribution of plants in connexion with the geographical position, the conditions of climate, and the physical peculiarities of the surface, in any portion of the earth immediately under consideration. In books, this study has been distinguished into two leading divisions, according to the difference of basis or starting point, from which the subject is taken under view. 1. *Geographical Botany* is understood to begin with the plants themselves, whether by individual species or in groups, and to trace their distribution over the surface of the earth, or over any portion of it. 2. *Botanical geography* regards the earth's surface itself, its parts and divisions, with relation to their floral productions. Shortly, the first may be said to treat about the places of the plants; the second, conversely, to treat about the plants of the places;—the word 'places' being here read in its least restricted sense.

Such a distinction is not without convenience and usefulness, as a logical idea; although it arises from the manner of viewing natural facts, and not from any real distinctness in the relations between botany and geography, or in those which connect plants and places.

In practice, the distinction cannot be very clearly or fully kept up; one department passing into the other almost imperceptibly. For instance, a local Flora enumerates the plants of some one particular place or country, whether a natural or a political division of the earth's surface. Two or more such Floras afford data for comparing the botany of separate portions of the earth, and for tracing out any floral characteristics by which those portions resemble or differ among themselves. In this respect, the Floras and their contents should class under the division of botanical geography. Again, local Floras also record the special places and census of their included plants, and usually show whether the species are partially or generally spread within the area, with other local conditions under which they are found. In this view, the same books may be said to treat about geographical botany.

Practically, the two artificial divisions of the general subject continually thus glide one into the other, and are closely commingled in books. Nor, indeed, are they always defined in the same decided manner as here done. Among the latest distinctions are those by Alphonse De Candolle, who condenses the definitions into titles for his second and third 'books'; the first 'book' being devoted to a special hobby of the learned Botanist. His divisions run thus, apart from the titles of subordinate chapters:—“1. Geographical Botany, or considerations on species, genera and families, from the geographical point of view.—2. Botanical Geography, or considerations on the various countries of the earth from the point of view regarding the vegetation which covers (*re-couvre*) them.” It does not appear that the prefixed syllable, in the verb quoted, is intended to have any special signification, different from that which is expressed by the

English word in its simple form. The practical uncertainty of the distinctions so laid down, is shown in the fact of M. De Candolle adopting one of them as a title for his own grand work which treats about both; thus virtually conceding that both may be and are comprehended under one of the designations. A more recent and anonymous writer,—one of philosophical character in thought, and rather copious in his literary style,—thus amplifies the titular definitions into an explanatory paragraph:—

“The investigation of the peculiarities of the vegetation of a given country, the relative proportions of the families, genera, species, or individuals it consists of, its relation to the climate, local configuration, and other peculiarities of the region, form a branch of geography to which he appropriately gives the name of botanical geography; whilst geographical botany, belonging more particularly to the province of the botanist, and the more special object of the present work, examines the distribution of species, genera, and families over the surface of the globe; searches after the origin of species, and their migrations, tracing the changes they may have undergone or still undergo, in their dispersion or distribution through the different geological periods they may have witnessed, their increase, diminution, or final extinction.” (Edinburgh Review, Oct. 1857.)

This definition is comprehensive; and it may assist in showing how extensive is the region of research, which men of enlarged thought can find within the confines of botanical science,—how vastly superior the study becomes, as an intellectual exercise, when thus raised above the limited views of those botanists who can only describe species and specimens, or make unconnected and aimless records of their localities. The anonymous paragraph



above quoted from the Review, in explanatory amplification of De Candolle's book and chapter titles, is presumed to have emanated from the same pen with the latest 'Handbook of the British Flora,' referred to on page 278 of this volume. By way of a curious contrast, the subjoined passage is here copied from the 'Introduction' to another 'Handbook of the British Flora,' which preceded that of Mr. Bentham by some few months :—

“With due deference to the opinions of other botanists, whose knowledge of plants and their distribution is profound, and to whose writings all students of botany are under heavy obligations, it is here submitted that the only fact worth knowing, respecting the occurrence of any plant in any given or assumed locality, is whether the plant is likely to be permanent in that station, or in its close vicinity.” (Irvine's Handbook, page 106.)

These two passages present the large and the little views of phyto-geographical science in amusing contrast ; the little view contracted into the extreme of littleness. It is the writer's own affair to reconcile the inconsistency of that latter opinion, when found among forty pages of compiled matter on the “geography of plants,” prefixed to a descriptive Flora. But after the open avowal of an opinion so strange, it will not be deemed at all strange that his forty pages on the subject are nowise remarkable for lucidity or accuracy. Indeed, Mr. Irvine appears imperfectly to apprehend the true bearings and purpose of phyto-geographical investigations.

For minds of larger and clearer views, it may be remarked in returning from the short digression, that the ultimate objects to be sought by phyto-geographical investigations, are neither the countries of plants nor the plants of countries. These inquiries are only the preliminary efforts towards ascertaining the necessary relations



or causal conditions by which plants and places are connected together. In attempting to trace out such relations it would be needful to oscillate between the two divisions of the study, as laid down by A. De Candolle and his Reviewer; now looking to one, now to the other of them, without any such decided severance being kept up. Even in preliminary arrangements of the data, such as constitute the staple of this treatise, relating to the plants of one country, and which await similar arrangements in other countries before they can be rendered properly causal, the two abstract divisions of the subject have run much together. To which of those two divisions, it may be asked, does the 'Distributive Census' on pages 262 to 264 belong? To either or to both, is the unavoidable answer to the query. On these and other considerations, the distinctions traced between geographical botany and botanical geography are not made primary and fundamental in this work; although it is admitted that they are clear and logical in the abstract idea, and can be made so in definition.

## 2. *On Floral Areas.*

In instituting comparisons between the floras of different countries, or between different portions of the same country, too little regard has usually been given to the effect of inequality of areas on the numerical values and proportions of their floras. Some few pages may here be usefully devoted to illustrating the influence of such inequality by examples. The known flora of the earth at large has been taken to include nearly 83,000 species (cellular plants always excepted) in accordance with the figures given by Dr. Lindley. The area of Britain has been stated at 88,000 square miles, after

Macculloch. So that, if every known species of flowering plant and fern could be brought into Britain, this one island would afford upwards of a square mile of surface for each species of plant. But Britain is only a small portion of the whole earth; and its own flora includes little more than a sixtieth part of the whole number of species alleged to be known. Supposing the known flora of the earth to be still far short of completeness, and that it may eventually be doubled in its numbers, through new discoveries and greater subdivision into segregate species, an average area of many square miles on the earth would still remain for each species. Within the narrower limits of Britain the 88,000 square miles of surface, set against 1425 species, would also allow an area of many miles to each species singly; that is, each species might have more than sixty miles of the surface to itself, if evenly divided. But no botanist requires to be told that an area of sixty square miles in England will produce some hundreds of species. Indeed, an area of one single square mile will be found to contain (say) 50 to 300 species, and occasionally even 400, according to fertility of soil and variety of local stations.

It is thus made very obvious that the smaller the area, the more numerous is the flora relatively to the space. This arises in the fact of many species being spread over wide areas, and being consequently counted many times over, in reckoning up the various floras for included spaces of much more limited extent than their own areas. In dividing Britain into two longitudinal divisions, western and eastern, comparatively few species were not counted in the flora of both. In making three latitudinal divisions, a majority of the species are found to be components of their three floras alike. In the eighteen provincial districts, full three hundred species (303, by the

census summary, on page 271) are counted as many times; entering into all their floras. Even in the more numerous sub-provincial districts, a hundred and twenty species are ascertained to belong to all their thirty-eight floras; scarcely eighty species being restricted to a single subprovince, and being so counted only once in those local areas, as they would be in the wider spaces.

The area of Europe has been estimated at 3,650,000 square miles. A full estimate of its flora, in even figures, may give 10,000 species. Dividing one number by the other, we get the result of only a single species to 365 miles of surface, or an allowance of so many miles to each species, if all grew separately on their apportioned share of the surface. The area of the British Isles, including Ireland, may be stated in even figures at 120,000 square miles. The British and Irish Floras together may be called 1450 species. Again dividing one number by the other here, we find the result of only a single species to 82 or 83 miles of surface. In Britain proper, apart from Ireland, we may divide the 88,000 square miles of area by 1425 species; the result being 61 or 62 miles of surface for each. Proceeding downwards to divisions and subdivisions of the island, we should find a decreasing number of square miles in proportion to species; until, in counties of intermediate size, the numbers of miles and species become equalised with each other; while in still smaller areas the species will exceed one to the single square mile; at length becoming some scores to the square mile in the barren wastes, or some hundreds in the richer and much varied portions of the surface.

The subjoined list will show the areas and floras, and the proportions between them, for spaces of various dimensions within Britain. Although the list prints into a



small space here, a botanist will find no difficulty in believing that it has required more than a small amount of time and patience in the making. The floras for all the areas are compilations brought as closely as could be to the same uniform standard, as regards nativity and specific distinctions; being adapted to the 'summary of distribution,' in former pages of this volume. The floras for the divisions and provinces are considered to be nearly complete; those for several of the sub-provinces being much less complete. It was, indeed, partly in order to call attention to those portions of Britain, for which the floras seem to be less fully known, that the list has been extended so as to include every province and sub-province; the selection of half-a-dozen being otherwise sufficient for the one object now more immediately under view; namely, the numerical relations of the flora to the size of its area.

Divisions of Britain.	Square miles.	Number of species.	Miles to a species.	Species to ten miles.
1 East Britain	43,580	1355	32.16	0.30
2 West Britain	43,823	1305	33.58	0.29
3 South Britain	38,474	1280	30.06	0.33
4 Mid Britain	26,555	1148	23.13	0.42
5 North Britain	22,374	930	24.06	0.41
Provinces.				
1 Peninsula	5,567	1009	5.51	1.81
2 Channel	5,464	1040	5.25	1.90
3 Thames	7,007	1051	6.66	1.50
4 Ouse	6,247	1002	6.23	1.60
5 Severn	6,764	998	6.77	1.47
6 South Wales	4,231	885	4.78	2.09
7 North Wales	3,194	938	3.40	2.93
8 Trent	5,431	922	5.89	1.69
9 Mersey	2,552	842	3.03	3.29
10 Humber	5,836	1015	5.75	1.73
11 Tyne	2,068	882	3.36	2.97



Provinces.	Square miles.	Number of species.	Miles to a species.	Species to ten miles.
12 Lakelands	2,551	860	2.96	3.37
13 West Lowlands	4,732	773	6.08	1.64
14 East Lowlands	2,485	768	3.23	3.09
15 East Highlands	9,828	890	11.04	0.90
16 West Highlands	5,500	682	8.06	1.24
17 North Highlands	4,766	542	8.63	1.13
18 North Isles	2,280	449	5.08	1.96
Sub-provinces.				
1 South Peninsula †	1,337	764	1.75	5.71
2 Mid Peninsula	2,585	876	2.95	3.38
3 North Peninsula	1,645	911	1.80	5.53
4 West Channel	2,373	882	2.69	3.71
5 Mid Channel	1,625	934	1.73	5.74
6 East Channel	1,466	917	1.58	6.25
7 South Thames	2,316	972	2.38	4.19
8 North Thames	2,445	944	2.59	3.86
9 West Thames †	2,246	785	2.86	3.49
10 South Ouse	1,515	869	1.74	5.72
11 North Ouse	2,024	903	2.24	4.46
12 West Ouse	2,708	893	3.03	3.29
13 South Severn	1,754	851	2.06	4.85
14 Mid Severn	2,483	894	2.77	3.60
15 North Severn	2,527	844	2.99	3.33
16 S. E. Wales *	1,972	706	2.79	3.58
17 S. W. Wales †	2,259	785	2.87	3.47
18 North Wales	3,194	938	3.40	2.93
19 East Trent *	2,611	621	4.20	2.37
20 West Trent	2,820	853	3.30	3.02
21 Mersey	2,552	834	3.05	3.26
22 E. Humber (query,	2,500	885	2.82	3.54
23 W. Humber size ?)	3,336	928	3.59	2.78
24 Tyne	2,968	882	3.36	2.97
25 Lakes	2,551	860	2.96	3.37
26 S. W. Lowlands *	2,525	643	3.92	2.54
27 N. W. Lowlands †	2,206	689	3.20	3.12
28 East Lowlands	2,485	768	3.23	3.09
29 S. E. Highlands	3,664	797	4.59	2.17
30 M. E. Highlands	3,228	807	4.00	2.50

Sub-provinces.	Square miles.	Number of species.	Miles to a species.	Species to ten miles.
31 N. E. Highlands	2,936	638	4.60	2.17
32 I. W. Highlands†	3,500	644	5.43	1.84
33 Ebudes†	2,000	509	3.92	2.54
34 L. N. Highlands†	2,325	469	4.93	2.01
35 U. N. Highlands*	2,441	413	5.91	1.69
36 Hebrides*	1,000	317	3.15	3.17
37 Orkneys	425	375	1.13	8.82
38 Shetlands†	855	294	2.90	3.43
Averages.				
1 Provinces of S. B.	5,496	995	5.51	1.90
2 Provinces of M. B.	3,794	867	4.32	2.54
3 Provinces of N. B.	5,593	641	8.21	1.34
1 Subprov. of S. B.	2,137	870	2.45	4.07
2 Subprov. of M. B.	2,655	796	3.36	3.00
3 Subprov. of N. B.	2,237	526	4.05	2.35
Series.				
1 All Britain	87,412	1425	61.34	0.16
2 England	57,812	1350	42.82	0.23
3 South Britain	38,474	1280	30.06	0.33
4 Province of Thames	7,007	1051	6.66	1.50
5 Sbp. of S. Thames	2,316	972	2.38	4.19
6 County of Surrey	760	840	0.90	11.0
7 Part of N. Surrey	60	660	.0900	110.
8 Ten miles of same	10	600	.0166	600.
9 One mile of same	1	400	.0025	....

## Signs.

\* Floras of these sub-provinces least complete numerically.

† Floras of these sub-provinces less incomplete, but not complete.

The figures in the above table suffice to establish some general facts; and also they suggest the uncertainty or unsoundness of many published comparisons, made between the numerical values of different floras; that is, of floras for different countries, unequal in their areas, in their geographical position, or in other important conditions. The figures of the table are sufficiently near

truth, to show that areas and floras have a numerical decrease at a very unequal rate. The decrease is very much slower for the species than for the spaces. Hence it follows, that the smaller is the area examined, the larger relatively is the flora found upon it. But other conditions modify this general rule in its special applications. For instance, in glancing down the column for number of species, it is quite evident that they have a decrease in the direction from south to north. The two rates and directions of decrease will interfere with and modify one another; the result being a less decrease where the smaller area is a more southerly one, and a greater decrease where it is a more northerly area.

As a more special instance, let the number of miles to a species, or the number of species to ten miles, in the province of East Highlands, be compared with the corresponding numbers for its three sub-provinces. The relative proportions or numbers are found to be widely different for the whole province and for its three portions; while these third parts of the whole (or thereabouts) agree rather closely with each other. North Wales, whether designated province or subprovince, will admit of comparison with the subprovinces of the East Highlands, on account of its approximate equality of area; while a comparison of North Wales and East Highlands, as two provinces, would be unsound on account of the latter being thrice the size of the former. Nevertheless, this smaller province of North Wales has a more numerous flora (absolutely, not relatively only) owing to its more southern position, perhaps combined with some other conditions.

So, again, on looking to the 'averages' for the provinces and subprovinces, as given in the table, it may be observed that one apparent exception is shown to the



rule of a decreasing number of species northward, relatively to area. The average or mean number of species, to ten miles of space, decreases from south to north in each trio; but at the intermediate step for the provinces there is a considerable excess. This is at once explained, on observing that the average area for those seven provinces is much under the averages for the other two groups. The narrowness of the island in its middle latitudes, from about 53 to 56, causes the provinces 8 to 14 to be of smaller size one with another; some of them being thus more equivalent to the subprovinces of the other two divisions.

The relation of species to area is most clearly brought into view in the latter portion of the table, under the head of 'series.' Commencing with total Britain, smaller and smaller areas are there taken in succession; each one being a part of that which immediately precedes it. In this manner, the comparison of a rapidly decreasing area, with its less rapidly decreasing flora, is made successively through portions of the same area and flora; much more correctly, therefore, than would be the case if two different areas of unequal size were compared;—say, for example, a hundred miles round Paris, with ten miles round London or Edinburgh. It should be observed that the single mile of North Surrey, at the end of the list, is remarkable for the variety of its plants, arising from diversity of surface. This was desired for the particular comparison; as a square mile of uniform surface would have afforded too unequal a comparison with ten miles of diversified surface, in other respects than the one essential difference of extent.

Further, it has been shown by the 'collective census of orders' on pages 359 to 361, that the species of some orders average a much higher census than those of other



orders. For example, the species of *Rubiaceæ* and *Onagraceæ*, one with another, occur in 48 counties; while those of *Liliaceæ* and *Campanulaceæ*, one with another, are found only in 21 counties. These four orders are represented in the flora of total Britain by 18, 13; 21, 14 species; the first and third, the second and fourth, being thus nearly on equality, with a slight superiority for *Liliaceæ* and *Campanulaceæ*. But in taking small sections of Britain, provincial or comital, the *Rubiaceæ* and *Onagraceæ* would usually assume the superiority, by reason of their greater frequency and wider diffusion; the census being the joint result of both these conditions of distribution. Inequality of area would in this manner interfere in some degree also with analytic comparisons, as well as with those made between total or collective floras for unequal spaces.

A. De Candolle has adduced examples for the purpose of showing that the number of species to the league, and the number of species in proportion to orders and genera, are much changed if calculations are founded upon floras for very unequal spaces. And he remarks (*Geog. Bot.* p. 1172) that "a great many botanists, untrained to numerical methods, have fallen into the error of comparing numerical proportions based on tracts too unequal between themselves." Some similar examples will be incidentally adduced a few pages onward in this work; especially with respect to influence of areal extent on the proportions which species bear to orders and genera.

### 3. *The Flora of Britain.*

*Its numerical value, geographical affinities, etc.*

1. The word *flora* is here to be understood as a collective term, employed to express the whole group of

flowering plants along with the ferns and fern-allies, and excluding the cellular flowerless plants ; it being practically impossible to treat the distribution of these latter in the same manner as that of the former. But the same word has also a different signification in botany, in regard to which it may not be out of place here to make a suggestion to botanists and printers. The word is in use both as the name of a book or class of books, and as a term of science. In the latter sense, when designating a collective total of species, it is properly printed without an initial capital ; unless, of course, when its employment as a head-title or other circumstance should render a capital letter indispensable. When used as the name of a book, which enumerates the plants of any given country, the same word would be conveniently distinguished by an initial capital. If this rule were observed, the 'British flora' would always be understood to mean the group or totality of British plants ; and the 'British Flora' would mean a book, in which those plants are described. It is curious to note the obscurity of meaning, which occasionally arises from disregard of this ready distinction in printed books. While no such distinction is made, "the species of the British Flora" may mean either those described as such in the work of Hooker and Arnott, or those found wild in Britain ; and these two are by no means necessarily the same groups of plants, either numerically or specifically.

2. *Geographical Affinities*.—The place occupied by our insular flora in that of the whole earth, or the relation borne by the former to the latter, or to any section of the latter, may claim some few pages of remark. In accordance with the geographical position of the British Isles their flora is almost exclusively European. It is a

fragment of the European flora, repeated in Britain, with very few additions from any other source. The inference seems plausible enough, and scarcely disputable on first thought, that the whole flora (less, those few exceptions, apparently from other sources) has been derived from the European continent. But this is by no means a certain fact, howsoever probable or plausible the opinion may at first appear to be ; there being as yet no other evidence of such origin, beyond the one fact of species-identity. It is likely enough that many species have reached the present surface of Britain by a migration from east to west, independently of those which have been carried in the same direction by human operations. But in admitting this likelihood, it is not to be hastily assumed also, that the migration of British plants has been exclusively in the one longitudinal course. Other species may have originally spread in a contrary course, that is, from west to east. Looking to the present distribution of the European flora, a gradual migration eastward seems as well supported by facts, as is a like migration westward. And no sufficient reason has yet been adduced, for holding Britain to be an exceptional portion of Europe in this respect. There are western species which are quite absent from the eastern side of Britain. There are other species which are now much more prevalent or plentiful on the western side of the island, though common to both sides. And there are many species found in Britain and western Europe, which have early limits eastward on the continent. These and other facts suggest ideas of a diffusion from west to east ; while various other facts of converse character equally suggest a diffusion from east to west.

In addition, the northern and southern tendencies are much more obvious than those in relation to longitude.



At the present time, within the limits of our own island, plants appear to be extending northwardly, and contracting their extension towards the south; though chiefly so, perhaps, through the instrumentality of mankind. Whether any of them originally migrated into Britain in the opposite direction, spreading from north to south, is a questionable conjecture, not devoid of probability, but supported by no botanical evidence, excepting the one fact of identity between certain British and arctic or sub-arctic species. The number of species common to Britain and to countries more southward, is greater than the number of species common to Britain and to countries more northward. The floral resemblance, however, is greater with the northern countries; because these latter commingle with them a less number of non-British species. On this subject, the valuable writings of C. Martins are well deserving of careful study.

Regarding the British Isles collectively, the most distinctive peculiarities in their flora are found on the western side. Thus, the *Eriocaulon septangulare*, a plant of Ireland and some of the westerly isles of Scotland, is constantly cited as a remarkable exception to the prevailing identity of the British flora with that of western Europe; since it belongs to a genus and order not otherwise represented in the European flora; and the plant becomes a constituent item in that flora only by its existence in the British Isles. The *Neottia gemmipara* of Smith, an extremely local and scarce orchid of South Ireland, hitherto has not been found in any other country; as is now again believed, although, some short time ago, it was supposed to have been identified with the American *Spiranthes cernua*. This orchid is the only plant allowed by Bentham's Handbook, as an example of a species really restricted to the British Isles, according to existing knowledge. [The



American plant having been originally named *Ophrys cernua*, that generic name has been inadvertently used for the Hibernian plant on page 228.]

The names of some other plants do also appear in books on British botany, which have not been identified exactly with species of the European continent. As all these are comparatively recent segregates, and most of them still distrusted species, if not doubted natives, they may none of them be really peculiar to Britain; unless, indeed, as local varieties of species found elsewhere in their more typical states. But it is to be kept in recollection, that in case any of these forms should eventually be found strictly limited to the British Isles, then must it be conceded that these Isles truly have their own peculiar plants, whether designated species, races, varieties, or aught else. At present, therefore, and while these forms remain unknown elsewhere, we are not warranted in asserting that the flora of Britain has been derived wholly and exclusively from Europe or other countries. On the contrary, the evidence so far goes towards proving a local inchoation (natural creation or commencement) of those species, races, or varieties. Under this aspect, those dubiously distinct plants assume a high phyto-geographical importance. Apparently, they constitute small items of evidence, bearing upon some of the grandest problems in phyto-geographical and phyto-geological science. In example, they may bear importantly on the remarkable and profound views of Mr. Darwin, recently announced (some months after the earlier sheets of this volume were printed) through the Journal of the Linnean Society, volume 3, page 45, August, 1858.

The writer of these pages admits that he would prefer to see genuine species in these local forms, still unknown

beyond Britain. But against his inclinations, he must still question the reality of any species being peculiar to Britain, unless it be the *Neottia gemmipara*, above mentioned. The *Dryas depressa*, of Ireland, has been before alluded to, on page 38. Its differential characters are so petty, and so likely to be disregarded elsewhere, that no stress can be laid upon this plant, as anything peculiar or distinctive in the flora of our islands.—*Helianthemum Breweri*, of Anglesea, looks distinct enough in the extreme form which has been selected to represent the “species”; and the printed characters, adapted to that extreme form, of course convey the same idea. Unfortunately, among a numerous collection of specimens brought afterwards from Anglesea, very few could be honestly said to correspond with the figure and description; the greater number of them bearing a suspicious resemblance to weakly plants of *H. guttatum*. It is believed that the peculiarities which mark and make the extreme form figured for *H. Breweri*, will admit of physiological explanation; but, as a fact, such explanation would require to be verified on the spot, early in the season; and on this account it is not stated here.—*Geranium lancastriense*, found originally on one islet in West England, is usually deemed a variety of *G. sanguineum*. In the present writer’s garden, the individual plants of it have retained their short and compact mode of growth, during many years, while placed under similar conditions alongside the diffusely spreading plants of the typical species to which it is assigned.—In *Sedum forsterianum*, of Wales, there is truly much the aspect of a species on a short acquaintance. But the printed characters relied upon for distinguishing it from *Sedum rupestre* are found to be variable; being inconstant in *S. forsterianum*, and occasionally assumed in some degree

by *S. rupestre*. In other words, the diagnostic characters of the alleged two species are only descriptions of some specimens, and are partially applicable even to the same individual plants at different stages of growth. Moreover, the apparent species of *Sedum* are too imperfectly ascertained or understood, to warrant any positive assertion that *S. forsterianum* is exclusively a British plant, either as variety or as species. — *Allium Babingtonii*, of Ireland and Cornwall, is a doubtful species and doubtful native. Contrary to reports about its difficult growth elsewhere under similar conditions, it has readily become a weed in a dry Surrey garden, spreading rapidly by its numerous bulbils; this being of course a simple repetition of the individual, not a renewal of the species. Unless reproducible by seed, continuously and unchanged, it might be more correct to regard this plant as a luxuriant variation of *Allium Ampeloprasum*; to which the more weakly examples of it occasionally approach by ceasing to produce the branched pedicels in the umbel. — *Viola Curtisii* is another plant of West Britain, more questioned as a true species now (Mr. E. Forster being deceased), and which may perchance yet be found in western Europe. When wild on the coast, it approximates much towards another plant of similar sandy situations, which is authoritatively referred to *Viola tricolor*, but often mistaken for *V. Curtisii*. When left to re-sow itself in a garden, it becomes very like some of the corn-field varieties which are referred to *V. tricolor*, except that the bracts are rarely toothed, and then only very slightly so. — *Saxifraga Andrewsii*, of Ireland, is truly puzzling. If not a real species, what is its parentage? The record of its discovery, as if truly a wild Irish plant, when read along with an inspection of the drawing of it by Dr. Harvey, left an impression that it might be a



wide variety of *S. umbrosa* ; but living plants of it kindly sent by Mr. J. G. Baker, do not confirm this idea. If of garden origin only, without native habitat, it is the commencement of an apparent species, as well entitled to be deemed a species on its external characters, as are great numbers of those described for species in books, and seldom or never questioned.

These are not all of the plants which have been described in Britain, either as species or as well-marked varieties, and have not been strictly identified with those of any other country. They are only to be taken as selected examples of the dubious species (but true varieties, if not true species) hitherto not certainly ascertained beyond the British Isles. The spurious species of *Salix*, *Rosa*, *Rubus*, *Mentha*, *Cerastium*, and *Hieracium*, hitherto described only on British specimens, can count as nothing in the main question, whether the British Isles do now possess any true species or distinct races peculiar to themselves, and therefore reasonably presumed not to have been derived from other countries still in existence.

The generally admitted link of connexion between the American and [British] floras, seen in the *Eriocaulon septangulare*, has been alluded to above. — Also, the connexion, mistakenly supposed to have been established, through an identity of *Spiranthes gemmipara* with *Spiranthes cernua*. — Some very small doubt may still attach to the *Alopecurus alpinus*, of Scotland ; whether this species is strictly identical with that of arctic America, and also with that of arctic Europe usually so named. — *Anacharis Alsinastrum* seems to be only an imported American *Udora*, now too abundantly established in England, and needlessly re-named here ; likely also identical with the *Udora* said to have become established in Prussia and West Russia. — *Sisyrinchium anceps* is



probably another recent importation into Ireland and Europe from the western hemisphere ; not constituting a true link of connexion between their native floras. — *Potentilla tridentata* has been reported a plant of Scotland, only on authority which English botanists have learned to distrust where not confirmed.

It thus appears to be quite true, that the British Isles have either no species or extremely few species peculiar to themselves ; all (others) being found elsewhere in Europe, with the very scanty exceptions above alluded to. But the same species nowhere all meet within any single political country or even well-defined natural division of Europe ; and everywhere they are found intermingled with other species which do not occur in Britain. It would be necessary to include a long tract, taking in all western Europe, from Spain to Norway, to make out a country large enough to show all the British plants, after deducting the *Eriocaulon* and *Spiranthes*, and perhaps *Alopecurus alpinus*, with other more doubtful species and doubted natives. And in that long space there would be found a large number of non-British species commingled with those common alike to Britain and western Europe. The farther we recede from western Europe, in any direction, the more do the British elements of the flora decrease in their proportions to the non-British ; so that eventually, at great and unequal distances, we find floras almost devoid of British species ; and finally, in some considerable tracts, even quite devoid of them.

These gradual changes, these agreements and differences between the flora of Britain and the floras of other parts of the Earth, near and remote, might be described and explained in a 'British and Foreign Cybele,' which would likely prove a contribution of much importance to

the progress of geographico-botanical science. The Author of this present work formerly entertained the hope of being able to carry out his conceptions in that form, after concluding the *Cybele Britannica*; this present work being unavoidably limited to more partial views and local details, than would have constituted the staple of the more comprehensive treatise, long contemplated, and reluctantly abandoned. The required time and requisite mental vigour can no longer be reckoned upon. Such a work ought to be undertaken by a younger botanist, who might hope to devote thereto a dozen or a score of years of active life and earnest effort. If any botanist should ever devote his time to such an undertaking, it will be well for him to keep steadily in recollection, that a volume of vague generalities would prove only worthless to science; while, on the other hand, crude details about species, unsifted from errors, and not condensed into tabular results, would be scarcely better.

3. *Number of Species.*—The Flora of Britain must still be deemed one of much uncertainty in respect to the number of species which compose it. In too many instances, as already much commented upon, botanists do not agree on the questions, which ought to be accounted the really natural species, and which among them are the really native species? These distinctions lie at the very foundation of phyto-geographical investigations; and it is consequently most needful to know and appreciate the grave difficulties which imperfect knowledge and contradictory opinions still place in the way of such investigations. Those difficulties might gradually become much lessened, if local and descriptive Floras were more usually written by men of philosophic thought, competent to reflect on what they observe, and to describe accordingly.

But while most of such Floras continue to be the works of men who are able only to observe and describe objects, with feeble capacity for reasoning and reflecting on that which they observe,—so long will those Floras fail to afford any great assistance towards clearing away those difficulties, even if they should cease to increase them.

At the present time a course has to be sought between two opposite errors or evils. On the one side, by discarding all the doubted species and distrusted natives, we might go to work with a flora much under-stated in numbers. On the other side, by admitting all alleged species and all alleged natives, we should be quite as likely to work with a flora very largely over-stated. It has been amply shown in preceding pages, that wide diversities of opinion are entertained by different botanists on these points. The still increasing extent of such diversities renders it impossible to fix upon any intermediate course between the two extremes,—that of apparent under-statement, and that of apparent over-statement,—which will be held at all satisfactory by more than a small section among the botanists whose views and practices diverge so widely. Due allowance must be made for this practical impossibility, in any estimates of number, and in all statistical comparisons.

An extremely rigid selection might reduce the flora of Britain below 1000 species. A very free recognition of doubted species and doubted natives, such as are or have been believed in by some one or more botanists, might likely raise the number above 2000 species. It is believed that lists could be made out which would substantiate these discordant estimates, if it were deemed worth while to devote time and type to an object so profitless. The intermediate number between those distant extremes would be 1500. Even this middle figure is much too



high ; for it can be made up only by including many disputed species, and also reckoning many of the colonists and denizens among the admitted natives. By the full lists before printed in this volume, it may be seen that the number of species is taken at 1425, including colonists and denizens, and also various quasi-species, scarcely to be distinguished by any eyes besides those of their local inventors, and mostly discarded by botanists who are accustomed to look widely over the world's flora. By a moderate reduction of one-third from the alleged species in the excessively subdivided genera *Rubus* and *Hieracium*, the number will become 1400 ; and where an even figure is wished for general comparisons, that may be the figure assumed to represent the present flora of Britain, instead of 1425.

It is to be recollected, that in so reckoning the flora as a collective total, various species are included which never actually associate with each other. Though brought together in book lists, they do not congregate within the same area in nature. *Erica ciliaris*, restricted to the vicinity of the south-west coast of England,—*Arbutus alpina*, found only in North Scotland,—*Andromeda polifolia*, occurring in the intermediate latitudes between those of the other two species,—*Calluna vulgaris*, diffused from one extremity of Britain to the other,—are all treated as if they were actual associates in counting up a single united flora for the whole island. Numerical results deduced from the total flora, though they may be true as averages in books, are thus made to represent numbers and proportions which do not really exist anywhere ; that is, which cannot be found in any single or separate portion of the island, either provincial or latitudinal. But there will doubtless always be a tendency for the fallacies in one direction to balance those in the



opposite direction, and in this mode to produce an intermediate neutrality or equilibrium. For instance, in a collective flora for total Britain we include about four score species which are restricted to the most southern portion of England, southward of the latitudinal line of 52; also nearly as many species which occur only in Scotland. The inclusion of the former gives too austral a character to the collective flora, and to the relative proportions of its orders, &c. The inclusion of the latter gives too boreal a character, in like manner. In the total or average result these opposite excesses may nearly balance one another. It takes a wider extent of the more boreal latitude, to balance a smaller extent of the more austral latitude; because the total number of species decreases in the northerly direction, as already shown by the summary on page 364.

4. *Number of Species in proportion to Orders and Genera.* — Taking the list of genera and species, as made out for the summary of distribution, and adding *Gladiolus* thereto, the total flora of Britain will be found to exhibit the subjoined numbers :—

Orders, 98.      Genera, 496.      Species, 1425.

And converting these numbers into proportions, the average number of species will run thus :—

To an order, 14.54.      To a genus, 2.87.

Regarded in themselves, these are only isolated facts of no import or importance. To give them significance and value, they must be brought into juxtaposition with other similar facts. First, how closely do these averages represent those for portions of Britain? If the three latitudinal divisions be taken apart from one another, the numbers may be stated thus :—

S. Britain has 97 orders, 475 genera, 1820 species.

M. Britain    94    „    434    „    1148    „

N. Britain    79    „    363    „    930    „

The species for these and other sections of the island not being yet ascertained with rigid exactness, the numbers are of course to be received as approximative, not perfectly precise. Progressive knowledge will continually render some changes needful in the figures which are supposed to represent facts, but which in truth represent only human knowledge about natural facts. Adopting the above numbers as true for the present, the average proportion of species to an order and to a genus will be thus :—

S. Britain has 13.19 to an order, 2.69 to a genus.

M. Britain    12.21    „    2.64    „

N. Britain    11.77    „    2.53    „

It thus appears that the averages for all Britain give more species to an order, and a fraction more to a genus, than the averages for any portion of the island. Further, a slight decrease is traceable from south to north. In making comparisons between these decreasing proportions or averages, it is to be recollected, first, that the areas of the three divisions decrease northward, secondly, that the numerical values of their three floras decrease northward, and thirdly, that the temperature decreases northward also. With which of these three differences the decreasing averages have the closest relation, it may not be easy to decide; probably all three combine to produce even the small arithmetical results above indicated. The comparison is carried into larger figures, and perhaps with less exactness, by making it between the flora of Britain and the floras for considerable sections of Europe, situate nearest to this island. Without looking into the details of genera here, the numbers of orders

and species for Middle Europe (France, Germany, Switzerland), for Scandinavia (Denmark, Sweden, Norway, &c.), and for the British Isles (Britain and Ireland) may be stated thus :—

Middle Europe has 118 orders, 4600 species.

Scandinavia            104    „    1700    „

British Isles        102    „    1500    „

The number of orders and species for the British Isles are here somewhat increased, for the purpose of bringing them into more exact comparison with those adopted in the works consulted for the other two portions of Europe. Otherwise, on the basis of the Cybele, its orders and species, the union of Ireland would be considered to add scarcely one score of species, and no other order, to the British flora. On the above figures, the average number of species to an order is thus :—

M. Europe, 38.91. Scandinavia, 16.34. B. Isles, 14.70.

It thus still appears that the larger area or larger flora (one or both) has more species in proportion to orders. For the purpose of bringing out this fact still more strongly, another comparison shall be resorted to, between the averages for Britain and for other areas, larger and smaller. The only local Flora for a county of Britain, which admits of ready comparison with the Cybele Britannica, is that for Yorkshire, amended and corrected by Mr. J. G. Baker, through the 'Supplement' lately published. The county of York exactly corresponds with the province of Humber; and being situate about the middle latitude of Britain, it is a very suitable tract for the comparison here sought to be instituted between successively smaller areas, each one being an included portion of the larger. The numbers before taken from Lindley's 'Vegetable Kingdom' shall be again taken to represent a flora for the whole Earth; those



from 'Nyman's Sylloge' being also again accepted for the European portion of it. By then adding Britain and Yorkshire, two other floras are obtained for subordinate portions of Europe and of our own island. These four floras present the subjoined numbers :—

Earth has 284 orders, 7854 genera, 82714 species.

Europe	131	„	1113	„	9677	„
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Britain	98	„	496	„	1425	„
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Yorkshire	90	„	404	„	1000	„
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Reckoned on these numbers which are not rigidly reduced to one uniform standard (exceedingly laborious if attempted, and barely within possibility, in respect to the two first areas named) the average proportion of species to an order and to a genus comes out thus :—

Earth has 291.24 to an order, 10.53 to a genus.

Europe	73.87	„	8.60	„
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Britain	14.54	„	2.87	„
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Yorkshire	11.12	„	2.47	„
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It is thus made quite clear that with decreasing areas the average number of species to a genus, and more especially to an order, is largely decreased also. Yorkshire, with nearly one-third of the orders, has only one-twentieth of the genera, or thereabouts, and a very much smaller proportion of the species.

Now, if it be assumed that the groups of systematic botany, orders and genera, do truly associate plants in approximate accordance with their natural similarities,—it is in this wise shown that the smaller the area, the less similar are the plants which inhabit it; that is to say, they represent more orders and genera in proportion to their absolute number of species; the relative diversity in the flora increasing as the space decreases. This fact appears to bear upon certain views propounded in regard to original centres. If there were originally



single centres of inchoation, — before explained to mean, *natural* creation or commencement, — those centres can hardly have been for European orders or genera, as groups, but only for species. Otherwise, it would seem to be a warrantable inference, or very probable expectation, that the more circumscribed the space under view, the more should its plants have belonged to the same orders, and to the same genera,—the less diversity should have been found in the flora.

5. *Numerical value of the Orders.*—Phyto-geographers usually appear to attach much importance to comparisons between the numbers of species belonging to different orders, and to the per-centage proportions that the several orders bear to the total flora. A table of such proportions will assist in showing the leading peculiarities of any single flora, and also the distinctive peculiarities between two floras, when these are sufficiently diversified to alter the ordinal proportions. But the non-equivalence of the orders, before particularly adverted to, pages 20 to 25, on which their inequality of numbers in any country is partly consequent, renders even those proportions less strictly comparable than they would be, if the orders were more the equivalents of each other in structural and physiognomical characters. The proportions of *Gramina* are those of a numerous and well-distinguished group; and they represent the sum of many genera. The proportions of *Juncaceæ* are those of a less distinct group; and they represent the sum of only few genera. The proportions of *Callitrichaceæ* are simply generic, scarcely entitled to be called ordinal at all; representing one genus only; and that one with no decided or obvious characters to stamp its distinctness,—say, for instance,

such as may warrant the elevation of *Equisetum* to ordinal rank, notwithstanding its paucity of species.

The numerical value and proportions of the orders represented in the British flora have been already exhibited under various aspects, general and partial, in the census tables printed on pages 359 to 367. Perhaps the formidable array of figures may deter some botanists from an examination of those tables. It is to be observed, however, that by placing the names in a columnar series, according to the numerical value of the orders in our island flora, the general idea is correctly expressed to the eye, by the mere position of the names, if a reader should not care to trouble himself at all with the figures. The position of *Compositæ* and *Gramina* at the top of the list fully expresses the fact, that the species of those two orders predominate in the flora. But it would not show, without the figures added in the two first columns of the 'collective census,' either the absolute or the comparative amount of their predominance. Neither would it show, without the figures in the two last columns of the same census being looked to, that the British flora corresponds with those of Europe and of the whole earth in the numerical superiority of the *Compositæ*; while it does not correspond with them in the position of the *Gramina*, second in the series. *Leguminiferæ* hold the second place in the floras of Europe and of the whole earth; though they yield to the *Gramina* in Britain. Subjoined is a more simple manner of portraying the absolute and comparative numerical values of the orders in the flora of this country:—

135. *Compositæ*. Nine and a half per cent.

112. *Gramina*. Nearly eight per cent. of the whole.

93. *Cyperoides*. Six and a half per cent.

82. *Rosacæ*. Five and three-quarters per cent.

70. Leguminiferæ. Under five per cent.
60. Cruciferæ. Nearly four and a quarter per cent.
57. Umbelliferæ. Caryophyllaceæ. Four per cent.
48. Scrophulariaceæ. Over three and a third per cent.
47. Lamiaceæ. Under three and a third per cent.
39. Filices. Orchidaceæ. Two and three-quarters per cent.
35. Ranunculaceæ. Nearly two and a half per cent.
34. Amentiferæ. Over two and a third per cent.
26. Polygonaceæ. Juncaceæ. Under two per cent.
24. Chenopodiaceæ. Under one and three-quarters per cent.
22. Potamaceæ. One and a half per cent. Too high?
21. Boraginaceæ. Liliaceæ. Nearly one and a half per cent.
20. Ericaceæ. One and two-fifths per cent.
18. Rubiaceæ. One and a quarter per cent.
17. Primulaceæ. Below one and a quarter per cent.
14. Geraniaceæ. Euphorbiaceæ. Gentianaceæ. Saxifragaceæ. Campanulaceæ. Scarcely one per cent.
13. Onagraceæ. Below one per cent.
30. Crassulaceæ. About three-quarters per cent.
10. Hypericaceæ. Violaceæ. Orobanchaceæ.
9. Equisetaceæ. Alismaceæ. Above one-half per cent.
7. Papaveraceæ. One-half per cent.
6. Plantaginaceæ. Caprifoliaceæ. Typhaceæ. Lycopodiaceæ. Fumariaceæ. Pinguiculaceæ. Plumbaginaceæ. Illecebraceæ.
5. Dipsaceæ. Valerianaceæ. Malvaceæ. Iridaceæ.
4. Urticaceæ. Solanaceæ. Pistiaceæ. Haloragiaceæ. Linaceæ. Callitrichaceæ. Coniferæ. Grossulariaceæ. Cistaceæ.
3. Convolvulaceæ. Droseraceæ. Lythraceæ. Nymphaeaceæ. Melanthiaceæ. Polygalaceæ. Cuscutaceæ.
2. Araliaceæ. Jasminaceæ. Resedaceæ. Rhamnaceæ. Araceæ. Ulmaceæ. Cornaceæ. Marsileaceæ. Thymeleaceæ. Hydrocharidaceæ. Amaryllidaceæ. Zosteraceæ. Ceratophyllaceæ. Elatinaceæ.
1. Oxalidaceæ. Portulacaceæ. Illicaceæ. Tamaceæ. Celastraceæ. Trilliaceæ. Verbenaceæ. Empetraceæ. Cucurbitaceæ. Aceraceæ. Loranthaceæ. Berberaceæ. Tiliaceæ. Santalaceæ. Apocynaceæ. Frankeniaceæ. Balsaminaceæ. Asaraceæ. Eleagnaceæ. Restiaceæ.



The first dozen orders in the above series are mostly well-marked groups of plants, not merely conventional combinations of genera. That they are such real groups is in some degree evidenced by their having received expressive names, not derived from particular genera, but suggested by some obvious structural or physiognomical character. *Amentiferae* and *Coniferae* are the only other groups in the series which accord with them in this respect. *Rosaceae* and *Caryophyllaceae* are the most decided exceptions; and the former group is perhaps misplaced among the highest, and also too forced or arbitrary as an ordinal combination of plants. Indeed, by Lindley and various other authorities this *Rosaceous* group is divided into four distinct orders. And *Caryophyllaceae* are so imperfectly distinguished from allied orders, that certain genera are tossed to and fro between them, or even split into more genera (e. g. *Spergularia*, cut from *Arenaria*) for the very purpose of being placed under different orders;—a rich illustration of the real conventionality of these pretendedly “natural” orders. Though latterly re-named after certain genera, *Scrophulariaceae* and *Lamiaceae* were long more familiar under the designations of *Personatae* and *Labiatae*. Whilst *Cyperoides* and *Orchidaceae* might equally well admit of descriptive class-names, without resorting to those of genera which imperfectly represent the groups.

The dozen orders reckon up to 839 species. Throwing out *Rosaceae*,—as divisible into several orders of lower grade, and also placed unduly high in the series, through excessive subdivision of *Rubus* into segregate species,—the other eleven orders will still count up to 757 species; being upwards of one-half of the total flora, after making some abatement also for spurious species of *Hieracium*. The remaining 77 orders have consequently less than half



of the flora distributed among them. This striking inequality seems to be a general fact. In Scandinavia, with a flora of 1700 species, nine orders make up together the number of 874, or rather more than half of the flora.—In Middle Europe, with a flora of 4636 species, nine orders count up to 2445 of them, being still rather more than the half.—In total Europe, it takes only eight orders to make up considerably more than half of the flora.—In the vegetable kingdom in general, according to the estimates in Dr. Lindley's erudite compilation so named, fifteen orders make up 42,304 species; a number which exceeds one-half of the total estimate.

It is thus evident that there is nothing peculiar or characteristic of the British flora, in the single fact of very few orders constituting half the numerical amount of that flora. The same fact is found elsewhere; the great bulk of the floras of most countries being assignable to a few leading orders, twenty or thirty, the smaller remnant being divided and subdivided among numerous other groups; which are often less conspicuously characterized, and slide more readily into each other. But it is to be noted, that the groups which predominate in the flora of Britain, are not precisely the same with those which predominate elsewhere; nor do they keep the same relative position in series arranged for different countries. The differences in this respect are usually or always found to increase as we descend in the scale of numbers; the larger orders usually keeping more similar proportions than are kept by the smaller orders in different countries. Indeed, as the floral differences between countries are more in species than in genera, more in genera than in orders, more in orders than in the great primary classes,—it seems to be quite in course that the larger (super-ordinal) orders should present a closer

approach towards an equality of numerical proportions in different countries, than the smaller (genera-like) orders are found to present.

*Compositæ* and *Gramina*, for example, occur everywhere; and in many of the most thoroughly examined countries, they constitute somewhere about the same portion or proportion of the aggregate flora. It is much otherwise with orders of more average numerical values, and which are more truly groups of genera; for example, *Saxifragaceæ* and *Oxalidaceæ*, slightly above average;—*Gentianaceæ* and *Geraniaceæ*, more decidedly above;—*Primulaceæ* and *Cucurbitaceæ*, below an average, in respect to number of included species;—the numbers and proportions of all these being widely dissimilar in various countries. Such dissimilarities are not to be found in the great groups like *Compositæ* and *Gramina*, but occur in their “sub-orders”; these latter being truly more on equality with the middling and the smaller orders, in respect to their structural and physiognomical distinctions, than the great groups are. The great leading orders may suffice for general (rather vague) comparisons between countries widely dissimilar in geographical position and climate; but they avail very badly for bringing into view those slighter differences in the flora and vegetation which are to be found between adjacent countries.

Here comes a practical difficulty for a writer on phytogeography. It is tedious and confusing, to attempt verbal comparisons carried through the whole series of orders. Selection becomes necessary; whether it is wished to show the ordinal relation which the flora of this country bears to that of the earth generally, or to any portion of it, — or it is wished only to institute comparisons between the orders in Britain itself, apart from other countries. But it is not easily determined what

sort of selection will best meet the object; namely, that of rendering the comparisons passably complete or full, yet without a confusing enumeration of too many orders. A. De Candolle has avowedly restricted his ordinal comparisons between different countries to the absolute numbers and per centage proportions of orders which together constitute one-half of the flowering plants (*Geog. Bot.* p. 1190). This is a restriction to about ten orders, more or less, and to those which usually present less differences than many others. It is objectionable, because comparing only half of the flora, and leaving out of view the widest dissimilarities. There appears to be no particular advantage in ascertaining simply the orders which predominate in various countries. If we would know and seek to account for the characteristic differences between countries, by aid of ordinal comparisons, it seems a better course to ascertain which of the orders present the widest dissimilarities; those only being left out of view, which approximate to genera by the paucity of their species, and the pettiness of their distinctions.

Now, in almost every country, a minority of the orders, — usually about a fourth, — will be found to include more than the average number of species. Such over-average orders include together the great bulk of the flora; especially so in small countries, or more properly in small floras, where many orders are usually represented by single or few species to each. In Britain, for instance, one-fifth of the orders are represented by single species, and as many more by two or three; scarcely half of the orders having more than four species in each. Or, by another mode of statement, the first 48 orders include 1320 species; while the remaining 50 orders include only 105 species. And dividing the 98 orders into three groups, — 33, 32, 33, — these groups of orders include



respectively 1227, 152, 46 species. As somewhat similar ordinal disproportions occur in the floras of other countries also, it is evident that ordinal comparisons can be instituted, which will prove much more comprehensive than those embracing only half of the species, and yet not requiring the enumeration of more than a fourth or a third of the orders themselves. Opinions may differ, whether the rule of selecting those orders which contain or exceed the average number of species, may be the best medium course to take; but it seems to meet the object above adverted to.

It has been shown on page 396, that the average number of species to an order, in this island, is about a medium fraction between 14 and 15. Only 23 of the orders exceed this average; and 5 more fall short of the average by the fraction only. All the remaining 70 orders include fewer than the average number of species.—Nearly the like proportions are found in Scandinavia, where 26 orders exceed the average of 16 species with a small fraction; 1 more falling short of it by the fraction only.—In Middle Europe 28 orders equal or exceed the average; which is there about 39 species to an order.—According to the Sylloge before quoted, 28 orders in the European flora exceed the average number of species; there rising to 74, less a small fraction.—In the vegetable kingdom at large, where the orders are more than doubly numerous, there may be twice as many which exceed the average number of species, rising to nearly 300; but the estimates cannot be held sufficiently exact or true, those for one order compared with those for another, to allow of any precise number or proportion being named and relied upon.

Another rule of selection might perhaps keep the selected orders more nearly on numerical equality;



1. *Orders predominant in the floras.*

1 <i>Earth.</i>	2 <i>Europe.</i>	3 <i>Britain.</i>
1. Compositæ, 9000.	Compositæ, 1401.	Compositæ, 135.
2. Leguminiferæ, 6500.	Leguminiferæ, 852.	Gramina, 112.
3. Gramina, 3800.	Cruciferæ, 579.	Cyperoides, 93.
4. Orchidaceæ, 3000.	Gramina, 554.	Rosaceæ, 82.
5. Euphorbiaceæ, 2500.	Umbelliferæ, 495.	Leguminiferæ, 70.
6. Cinchonaceæ, 2500.	Caryophyllaceæ, 493.	Cruciferæ, 60.
7. Lamiaceæ, 2350.	Lamiaceæ, 411.	Umbelliferæ, 57.
8. Filices, 2040.	Scrophulariaceæ, 381.	Caryophyllaceæ, 57.
9. Cyperoides, 2000.	Ranunculaceæ, 277.	Scrophulariaceæ, 48.
10. Scrophulariaceæ, 1814	Rosaceæ, 272.	Lamiaceæ, 47.
11. Cruciferæ, 1600.	Liliaceæ, 256.	Filices, 39.
12. Umbelliferæ, 1500.	Cyperoides, 255.	Orchidaceæ, 39.
13. Myrtaceæ, 1300.	Boraginaceæ, 204.	Ranunculaceæ, 35.
14. Liliaceæ, 1200.	Rubiaceæ, 170.	Amentiferæ, 34.
15. Melastomaceæ, 1200.	Campanulaceæ, 162.	Polygonaceæ, 26.
16. Ericaceæ, 1080.	Amentiferæ, 130.	Juncaceæ, 26.
17. Caryophyllaceæ, 1070.	Euphorbiaceæ, 124.	Chenopodiaceæ, 24.
18. Rosaceæ, 1000.	Chenopodiaceæ, 114.	Potamaceæ, 22.
19. Ranunculaceæ, 1000.	Orchidaceæ, 111.	Boraginaceæ, 21.
20. Malvaceæ, 1000.	Saxifragaceæ, 109.	Liliaceæ, 21.
21. Asclepiadaceæ, 910.	Orobanchaceæ, 108.	Ericaceæ, 20.
22. Solanaceæ, 900.	Plumbaginaceæ, 100.	Rubiaceæ, 18.
23. Campanulaceæ, 875.	Crassulaceæ, 97.	Primulaceæ, 17.
24. Cactaceæ, 800.	Primulaceæ, 93.	Geraniaceæ, 14.
25. Acanthaceæ, 750.	Iridaceæ, 87.	Euphorbiaceæ, 14.
26. Convolvulaceæ, 660.	Dipsaceæ, 86.	Gentianaceæ, 14.
27. Proteaceæ, 650.	Cistaceæ, 81.	Saxifragaceæ, 14.
28. Verbenaceæ, 610.	Polygonaceæ, 74.	Campanulaceæ, 14.

namely, to consider as primary orders all those which include one per cent. or upwards of the total flora. But any such rule is of course arbitrary, and can be adhered to only as a practical convenience. On turning to the census, page 359, it will be seen that we should stop at *Primulaceæ*, the twenty-third order, if rigidly restricting comparisons to those British orders which exceed the

2. *Orders predominant in the floras.*

1 <i>Middle Europe.</i>	2 <i>Scandinavia.</i>	3 <i>Britain.</i>
1. Compositæ, 625.	Compositæ, 158.	Compositæ, 135.
2. Leguminiferæ, 370.	Cyperoides, 144.	Gramina, 112.
3. Gramina, 309.	Gramina, 138.	Cyperoides, 93.
4. Cruciferæ, 250.	Rosaceæ, 90.	Rosaceæ, 82.
5. Umbelliferæ, 213.	Cruciferæ, 79.	Leguminiferæ, 70.
6. Caryophyllaceæ, 175.	Caryophyllaceæ, 74.	Cruciferæ, 60.
7. Scrophulariaceæ, 171.	Leguminiferæ, 73.	Umbelliferæ, 57.
8. Cyperoides, 167.	Amentiferæ, 60.	Caryophyllaceæ, 57.
9. Rosaceæ, 165.	Ranunculaceæ, 58.	Scrophulariaceæ, 48.
10. Lamiaceæ, 154.	Scrophulariaceæ, 57.	Lamiaceæ, 47.
11. Ranunculaceæ, 147.	Lamiaceæ, 54.	Filices, 39.
12. Liliaceæ, 109.	Umbelliferæ, 52.	Orchidaceæ, 39.
13. Amentiferæ, 88.	Orchidaceæ, 43.	Ranunculaceæ, 35.
14. Orchidaceæ, 76.	Filices, 37.	Amentiferæ, 34.
15. Boraginaceæ, 73.	Juncaceæ, 36.	Polygonaceæ, 26.
16. Primulaceæ, 72.	Potamaceæ, 30.	Juncaceæ, 26.
17. Saxifragaceæ, 65.	Polygonaceæ, 29.	Chenopodiaceæ, 24.
18. Campanulaceæ, 65.	Chenopodiaceæ, 28.	Potamaceæ, 22.
19. Euphorbiaceæ, 59.	Liliaceæ, 28.	Boraginaceæ, 21.
20. Rubiaceæ, 56.	Ericaceæ, 24.	Liliaceæ, 21.
21. Chenopodiaceæ, 52.	Boraginaceæ, 22.	Ericaceæ, 20.
22. Gentianaceæ, 52.	Primulaceæ, 20.	Rubiaceæ, 18.
23. Crassulaceæ, 50.	Violaceæ, 18.	Primulaceæ, 17.
24. Juncaceæ, 49.	Rubiaceæ, 17.	Geraniaceæ, 14.
25. Filices, 47.	Gentianaceæ, 17.	Euphorbiaceæ, 14.
26. Polygonaceæ, 44.	Saxifragaceæ, 17.	Gentianaceæ, 14.
27. Violaceæ, 43.	Geraniaceæ, 16.	Saxifragaceæ, 14.
28. Cistaceæ, 40.	Campanulaceæ, 15.	Campanulaceæ, 14.

average number of species ; and should go down to *Campanulaceæ*, the twenty-eighth order, if those which attain the average within a fraction are also taken in. This latter number gives a better point for stoppage in the series for some of the other portions of the earth also, and will here be resorted to ; namely, in the tables which are set above on these two pages.

In the first table, the first column enumerates the 28 predominant orders for the vegetable kingdom in general, according to present estimates ; the second does the same for those of Europe, according to Nyman's Sylloge ; the third column in return repeats those for Britain. The consecutive nos. prefixed to the first column may avail for comparisons between that column and the other two. If the name of an order stands higher in the first or second column, than the same name is placed in the third column, that order may be deemed relatively deficient, or weak numerically, in this country. On the contrary, if the name is placed higher in the third column, than it stands in the first or second, that order is relatively in excess in this country. If the name of one order is repeated in the same place for two or three columns, the order may be considered as keeping the same relative position in the flora ; for instance, *Compositæ* stand no. 1 in all three columns ; and it is the only order which does stand on equality in all. *Leguminiferae* are no. 2 in the first and second columns ; but these plants are exchanged for *Gramina* in the third column. It is not to be overlooked, however, that the orders for the earth generally are more than double those for Britain, and the orders for Europe also considerably exceed the latter in number. To a certain extent, this may be considered to make direct comparisons between the several columns inexact or fallacious.

In the second table, Middle Europe and Scandinavia are substituted for the earth and all Europe, with a view of bringing out a similar floral comparison between this island and neighbouring portions of the European continent. Middle Europe will be understood to include France, Germany, and Switzerland ; the ordinal numbers being founded on Lamotte's 'Catalogue,' with the exclu-



sion of Corsican plants and some others. Scandinavia includes Sweden, Norway, Denmark, and Finland; the ordinal numbers being derived from the 'Summa Vegetabilium' by Fries, with some few omissions and changes.

An intelligent reader will perceive the peculiarities which distinguish the British series of orders in either table from the other two, without explanation in much detail. Some few may be mentioned, by way of illustrating the use and purport of the arrangement. It is curious that in some respects the relative position of orders for Britain should resemble their position for the whole earth, more than for Europe. In the first table *Filices* stand 8 for the earth generally, 11 for Britain; while they do not come among the 28 predominant orders in Europe; being only no. 29, if the series had been continued. The *Orchidaceæ* likewise hold a position in the British series much above their position in Europe; in this respect approaching nearer to their estimated position in the vegetable kingdom at large. As no. 4 in the latter, however, the order probably stands too high; Dr. Lindley's familiarity with the species having likely led him to estimate their numbers too high in comparison with those for some of the other orders. Indeed, it is to be borne in recollection that the figures following the names in the first column are all of them estimates only, and unavoidably of unequal reliance.

In the other comparative arrangement, table second, the resemblance is closer between the series for Britain and for Scandinavia, than it is between either of these and Middle Europe. *Compositæ* and *Rosaceæ* stand on the same lines for both. *Cyperoides* and *Gramina* come between those two orders, though with a change of place between themselves. Nos. 1 to 4 thus present the same four orders for the two countries. From 5 to 14 the



same ten orders occur, though variously placed. Between 13 and 18 the four orders again correspond, and are also differently placed. Three more lines present the same three orders for both countries. And with the change of *Euphorbiaceæ* in Britain, for *Violaceæ* in Scandinavia, the succeeding seven lines again present seven same orders, ending with *Campanulaceæ* on the last line for both countries; the position of this last-named order, however, depending on the union with it of *Lobeliaceæ*. The high position of *Leguminiferæ*, and the low position of *Juncaceæ*, may be held indicative of the drier and warmer climate of Middle Europe, when compared with Scandinavia or Britain. But the higher position of *Primulaceæ* in Middle Europe will not admit of the same explanation; the order there rising above its position for Britain or Scandinavia, on account of its many alpine species, which do not extend to the more arctic mountains.

#### 4. *The Vegetation of Britain.*

*Vegetation* and *flora*, though not seldom employed with a mixed or interchanged meaning, ought to be held non-synonymous words. The *flora* is an aggregate or totality of the species in any given country. The *vegetation* is an aggregate or total mass of its individual plants. In floral statistics, the rarest and least seen species counts as an equal unit with the commonest and most conspicuous. In vegetal statistics (if a contrasting word may be made) size and frequency are also taken into account. In the flora of Britain, the *Epipogium aphyllum* and *Orchis maculata* count as equals. In the vegetation, the half-dozen or fewer examples of the former—all hitherto found—ought to count at a very low figure in comparison with the many thousands of the latter which are to be

seen every year. The rarely found *Menziesia cærulea* is an unit of the British flora, equally with the abundant *Calluna vulgaris*. Widely unequal, however, are these two shrubs in the vegetation. The insignificant *Limosella aquatica*, small in size and occupying only a small space in each special locality, is florally an equal with *Betula alba* or *Vaccinium Myrtillus*. By individual size, and by mass of vegetation, the two latter are enormously superior. The genus *Orobanche*, with its eight or ten species, counts as the equal of *Hypericum* or *Viola* in the flora of this country. But in its vegetation single species of *Hypericum* or *Viola* prevail more than do all the species of *Orobanche* added together.

No method has yet been devised for adequately expressing these vast differences between species, even when viewed singly; much less when grouped into orders, &c. The terms usually employed—‘rare-scarce-occasional-common-abundant’—are quite inadequate; although, if mentally construed to mean ‘units-tens-hundreds-thousands-millions,’ and qualified by the addition of ‘rather’ and ‘very’ for intermediates and extremes, they may serve to express the facts intelligibly, if somewhat too unprecisely. But when thus understood and used, they belong properly to the census of species, and are badly applicable to groups of any kind. It is very desirable to have some method for showing the comparative prevalence of orders and of genera, which shall bring into joint account the number of their species and also the frequency and dimensions of their species. Very difficult is it to make any fair approximation to such a joint result; and not easy, even if the most difficult item in the account, that of size or dimensions, be left out of the reckoning.

On looking to the last section of the ‘census of species,’

page 269, it may be seen that 77 species are deemed peculiar to single sub-provinces, on present knowledge of their localities; some 20 or 22 of them being found in two counties each. In a comital census of the vegetation, those 77 species together would count only equal with *Bellis perennis* or *Plantago lanceolata*, ascertained in 97 or 99 counties and vice-counties. By a sub-provincial census, they would be made about equal with the *Bellis* and *Plantago* united; that is, 77 sub-provinces would be nearly the same as twice 38. If based upon a large number of local sections, a census of species does in this manner supply data for making some sort of approach towards an ordinal census of the vegetation, as distinguished from an ordinal census of the flora; repetitions being reckoned up, instead of the number of species simply. Still, even this degree of approach may be distant from the reality; it being likely enough that twice 77 species might be selected, which in their aggregate are not represented by as many individual plants, as either the *Bellis* or the *Plantago*. And so with many others.

But that 'census of species' is itself partial and imperfect on another ground; namely, through taking no account of size in connexion with frequency, or of the compound character of arborescent and other branching species. The winter buds of trees are so many plants, chained together through the trunk and branches; each of them equivalent (say) to the underground bulb of a snowdrop, or to the surface bulb of a butterwort in winter. In this way one single shrub or tree might be held equivalent to hundreds or thousands of snowdrops and pinguiculas; and it will produce as great a quantity of vegetation, when its buds expand into twigs under the sun of summer. While regarding species through this



view, there may be said to remain still something of the numerical character, in comparing one tree with many herbs. But when mere size is under consideration, even that rude approach towards numerical comparability seems to fail and become no longer available.

How many plants of *Centunculus* are equivalent to one of *Digitalis*? — How many tufts of *Juncus effusus* are equivalent to one tree of *Taxus baccata*? — Answer these queries to yourself, sensible reader, as best you can; and then recollect that like queries and answers should be extended also to each one of the whole 1425 species, compared with each and all of the rest. It seems almost hopeless to expect any sort of answer, such as can be brought to bear correctly upon ordinal proportions. We may compare together the numbers of species included in different orders. We may also less precisely compare the number of their repetitions, or the extent of their areas, with the object of ascertaining comparative frequency. But the further effect and influence of their relative size, in constituting the mass of vegetation, can scarcely be noted otherwise than empirically, as a sort of physiognomical character; one often obvious to the eye, but not admitting of measurement or computation.

How best to present the joint result of numbers and frequency, leaving size and compound character out of the question? — It is undeniable that the census of species before printed, pages 234 to 271, and the third column of figures in the census of orders, pages 359 to 361, must present a better summary of the vegetation, than any other census can do, which is restricted to the number of species, exclusively of their frequency. It is then to that third column, as an ordinal summary of the census of species, we must look for an answer to the question. The figures in that column represent the



comital repetitions of all the species of an order added together into one aggregate sum. And if the orders be re-arranged into a series corresponding with those aggregate sums, we obtain an ordinal census of the vegetation, which differs considerably from the ordinal census of the flora.

Next, is it possible in any manner to bring into the comparison also the size and compound character of the species? — This question is far more difficult to answer; that is, to answer in any other form than by the simple negative. It would be quite possible, indeed, to fix upon a scale of size, ranging (say) from *Radiola* to *Quercus*, from 1 to 1000, or from 1 to 10,000; not by so many single steps, but by leaps increasingly wide, so as to form 20 or 50 grades; which would admit of relative comparison, without pretending to be either absolute or exact. The grades once fixed on, the figure which represented the size of any species, following the scale, might be multiplied by its comital repetitions. The products of such multiplication, added together by orders, would constitute an ordinal census of the vegetation, compounded of the number and size of the species, with their comital repetitions or frequency.

Although quite possible to patience and leisure, in any country where the localities of plants are numerously recorded, and by a botanist very familiar with the usual size of the species, the trouble of working out such a census may be deemed greater than would be compensated by any useful result likely to emanate therefrom. The experiment has been tried for Britain, indeed, by the writer of this volume; the results corresponding with the physiognomical aspect of the vegetation, in the main, more truly than those given by the number of species, or by the number of their repetitions, apart from size. But

the relative places of plants, in the scale of size, were found to be so uncertain in many individual instances, that it is doubted much whether botanists in different countries would ever bring out results fairly comparable with each other, by this laborious process. And if not comparable, they would be useless.

The uncertainty arises out of the wide dissimilarities between plants, in their general appearance and mode of growth. There is no doubt or difficulty in deciding that a *Plantago* is larger than a *Pinguicula*,—that *Hottonia* is larger than *Utricularia*,—that *Convolvulus sepium* is larger than *Convolvulus arvensis*,—that *Arundo Phragmites* is larger than *Phalaris arundinacea*,—that *Polystichum angulare* is larger than *Blechnum boreale*,—that *Juniperus communis* is larger than *Calluna vulgaris*,—that *Fagus* and *Ulmus* are larger than *Alnus* and *Corylus*; and so on, with respect to very many other British plants, when thus placed in pairs of similar character and growth. And it is easy enough to form ascending series of a dozen or a score of species, thus mutually similar and comparable. But how to compare sizes between plants very dissimilar, is the real difficulty. How to compare a *Carex* with a *Plantago*,—a *Juncus* with a *Carduus*,—an *Orchis* with a *Potamogeton*,—an *Equisetum* with a *Lycopodium*,—the *Ferns* with the *Grasses*,—slenderly erect plants with tufted or creeping kinds?

It seems then, that repetitions of species must be taken, apart from their dimensions, as the only practicable measure or test of ordinal predominance in the vegetation; subject to the interfering alternative, that comital repetition may signify either a greater frequency or a wider area. In a serial or progressive arrangement of the orders under this test, one slight modification may be advantageously made, by grouping them according to

a conspicuous vegetal character. What would otherwise be a linear series of orders may be converted into a binary or ternary series, by separating from the rest those orders which include shrubs and trees, or the dicotyledons from the monocotyledons and acotyledons. This is done in the arrangement on the opposite page; where the orders are placed in correspondence with the census figures, which were introduced into the 'summary of distribution,' and were also set after their names in the floral census on pages 359 to 361. But a second and shorter series is made, apart from the principal one, by removing those orders which include *trees* or *shrubs*, and placing them in a second column. A third series is in like manner made by separating also the *monocotyledons* and *acotyledons*, and placing these together in a third column. As the second and third series are short, the general series of *herbaceous dicotyledons* is continued into the lower portions of both columns. Through this slight change of arrangement the relative positions of orders of the same character are rendered more readily comparable. The ligneous orders are also brought up higher in the scale, more in conformity with their conspicuousness in the general vegetation. And the actual positions which all would hold in a single linear series, are still sufficiently shown by the figures set after the names of the orders.

Some seeming anomalies occur in the arrangement which are easily accounted for. There can hardly be a doubt that *Leguminiferae* stand too high, where placed at the head of the second column. In the general vegetation, that order is exceeded by *Amentiferae* and *Rosaceae*, and perhaps also by *Ericaceae*. It is placed with the ligneous orders chiefly on account of the vegetal importance of *Ulex*, which is so conspicuous an item in the



*Ordinal Census of the Vegetation.*

Compositæ, 5600.	Leguminiferæ, 2850.	Gramina, 5007.
Umbelliferæ, 2383.	Rosaceæ, 2714.	Cyperoides, 3402.
Lamiaceæ, 2366.	Amentiferæ, 1239.	Filices, 1795.
Caryophyllaceæ, 2338.	Ericaceæ, 667.	Orchidaceæ, 1251.
Scrophulariaceæ, 2211.	Caprifoliaceæ, 326.	Juncaceæ, 1200.
Cruciferæ, 2156.	Araliaceæ, 159.	Potamaceæ, 727.
Ranunculaceæ, 1654.	Jasminaceæ, 132.	Liliaceæ, 450.
Polygonaceæ, 1353.	Coniferæ, 112.	Equisetum, 442.
Boraginaceæ, 923.	Ribes, 110.	Alismaceæ, 414.
Rubiaceæ, 869.	Rhamnus, 92.	Typhaceæ, 314.
Primulaceæ, 814.	Ulmus, 73.	Lycopodium, 261.
Chenopodiaceæ, 796.	Ilex, 72.	Lemna, 200.
Geraniaceæ, 758.	Cornus, 65.	Iridaceæ, 142.
Onagraceæ, 626.	Euonymus, 62.	Melanthiaceæ, 123.
Hypericum, 592.	Daphne, 57.	Araceæ, 86.
Euphorbiaceæ, 478.	Empetrum, 54.	Tamus, 63.
Gentianaceæ, 474.	Acer, 50.	Paris, 59.
Plantaginaceæ, 466.	Viscum, 33.	Marsileaceæ, 58.
Saxifragaceæ, 449.	Berberis, 30.	Hydrocharidaceæ, 50.
Viola, 446.	Tilia, 19.	Amaryllidaceæ, 49.
Campanulaceæ, 440.	Vinca, 18.	Zostera, 49.
Papaveraceæ, 376.	Hippophae, 5.	Eriocaulon, 2.
Crassulaceæ, 330.	—	—
Dipsaceæ, 328.	Callitriche, 169.	Montia, 80.
Urticaceæ, 309.	Orobanchaceæ, 164.	Helianthemum, 79.
Valerianaceæ, 301.	Drosera, 154.	Cuscuta, 59.
Fumariaceæ, 258.	Lythraceæ, 148.	Verbena, 56.
Malvaceæ, 245.	Nymphæaceæ, 131.	Bryonia, 50.
Solanaceæ, 229.	Reseda, 131.	Ceratophyllum, 44.
Pinguiculaceæ, 206.	Plumbaginaceæ, 126.	Thesium, 19.
Holoragiaceæ, 189.	Polygala, 98.	Elatine, 16.
Linaceæ, 188.	Illecebraceæ, 89.	Frankenia, 11.
Convolvulus, 170.	Oxalis, 84.	Impat. 6. Asar. 6.

botanical landscape of England. Otherwise, its more suitable place would have been second among the herbaceous orders. Again, *Ilex* is a more important and



conspicuous item of English vegetation than *Ribes*; though the four species of the latter bring up their comital repetitions to a higher figure than those of the single *Ilex*. So, again, *Acer* and *Empetrum* compose more of the vegetation of Britain than *Daphne* does; but the few comital repetitions for the two species of the latter, added together, make a higher figure than do those for the single species of the former, taken as separate orders. In comparing *Rosaceæ* and *Amentiferæ* it is to be remembered that the former order is rendered unduly numerous through excessive segregation among the species of *Rubus*; while in the latter the over-numerous species of *Salix* have been aggregated into half of the old number. The trees of *Rosaceæ* are comparatively rare, and never form forests; while those of *Amentiferæ* are several of them common in hedges, and frequently constitute extensive groves and forests. The catkin-bearers ought probably to stand above the rose-flowerers.

In the third column *Gramina* rightly stand first. It is quite within belief that in ages long past, — before man drained so many swamps and marshes, converting them into meadows and pastures, corn-fields and road-ways of various kinds, — the *Cyperoides* may have composed more of the vegetation than the *Gramina* then did. Perhaps they still do so in North Britain, where various species of *Scirpus*, *Carex*, and *Eriophorum* prevail so abundantly. It is somewhat remarkable to find *Orchidaceæ* and *Juncaceæ* so nearly equal; the size and abundance of *Juncus conglomeratus* and *effusus*, with the frequency of some other species of *Juncus* and *Luzula*, seeming to give that order a real predominance in the vegetation. Their plentifulness is neutralised in the total result by the restricted areas of the alpine species; and three of them are also maritime species, unknown in the inland coun-

ties. The mingling of *Filices*, *Equisetum*, *Lycopodium*, and *Marsileaceæ* with the monocotyledonous orders, was simply a matter of convenience ; there being no space to make them into a fourth parallel column. In mass of vegetation, possibly, the *Ferns* exceed the *Sedges*.

In the first column, and its continuations in the second and third, devoted to the herbaceous dicotyledons, the orders seem to take sequence very well in accordance with their vegetal prevalence. *Plantaginaceæ* may be considered too low ; but they stand above any other group of only six species. Looking to *Buxus*, the *Euphorbiaceæ* might have claimed place in the second column ; but the rarity and doubtful nativity of that one shrub seemed to forbid the change. *Solanaceæ* and *Che-nopodiaceæ* each include one soft herb-like shrub, not warranting their removal to the ligneous group of orders.

In those orders which are represented in Britain by a single genus to each, the generic name is used instead of the ordinal name, as in some of the former lists. This practice assists to keep in recollection the fact, that ordinal comparisons may be very unequal. In comparing an order consisting of one genus, with an order including several genera, we compare the simple and the composite, the uniform and the varied, a minor group with a major group. The comparison which sets *Lycopodium* against *Leguminiferæ*, or *Hypericum* against *Ranunculaceæ* is really a very unequal contrast. But when that single genus represents a large order of various genera, thus reduced to one in Britain, the inequality is itself an important fact in phyto-geography ; for example, the reduction of *Cucurbitaceæ* to the single *Bryonia*, or of *Apocynaceæ* to the single *Vinca*.

There remains yet another aspect meriting notice, under which the ordinal grouping of plants may be viewed in relation to a vegetal census. A glance at the fourth column in the collective census, pages 359 to 361, suffices to see that the species of some of the orders tend to prevail in the vegetation, taken one with another, much more than do those of other orders. The averages for some orders are high, for others they are low, when compared with the mean average of 41 for the whole. It is interesting to seek an answer to the question, which of the orders thus tend to prevail in the vegetation of this island, by the wide diffusion and frequent occurrence of their individual species, whether few or many? In the 'ordinal census of the vegetation,' as printed on page 419, numbers and frequency of species are taken together. Suppose, for the sake of an illustration by even figures, one order including 20 species, with 50 comital repetitions for each;—another order including only 10 species, with 100 repetitions for each. The aggregate census would be 1000 for each of the orders; and this figure would correctly represent the total numerical value of the orders in both cases. On the one side, the doubled number of species would compensate for their lesser frequency. On the other side, the doubled frequency would in turn compensate for their scantier numbers. But this ordinal equality would fail to express the special distinction between the orders; namely, that the species of one order were comparatively rare, and those of the other order were comparatively common. The fourth average or column referred to was added to the third or census column, with a view of showing this difference; and the citation here of a few examples may render it more clear.

The order *Plantaginaceæ* includes six species. One of these is an inconspicuous aquatic; a second of them is a



littoral species; a third may be deemed sub-maritime, especially in its more northerly provinces. These characters of place and conditions of growth must somewhat keep down the census of those three species, when based on the vice-comital sections; some of which are quite inland, and others including few places suitable for the first and third species. Nevertheless, the average frequency for the six species of this order rises to the high figure of 78; and in this respect it is exceeded only in two orders, *Oxalidaceæ* and *Portulacææ*, each represented by only a single species. *Araliaceæ* and *Urticaceæ* are nearly the same, their averages being 78 and 77 repetitions for a species. These high averages quite accord with the great prevalence of plantains, ivy, and nettles in the vegetation. Their paucity of species must prevent those orders being absolutely predominant in the vegetation, as compared with grasses and composites, or catkin-bearers and umbellates. But if compared with some other orders, more equal to them in species, it becomes evident to the observant British botanist, that they have a decided tendency to become predominant in the vegetation, as much as the limited number of specific forms may permit a predominance. Three quartets of orders may be compared under this view:—

Plantaginaceæ, 78. Urticaceæ, 77. Araliaceæ, 78. Oxalidaceæ, 84.  
 Lycopodiaceæ, 43. Linaceæ, 47. Rhamnaceæ, 46. Araceæ, 43.  
 Pinguiculaceæ, 34. Cistaceæ, 10. Cornaceæ, 32. Santalaceæ, 19.

Such wide differences of average as are shown between the first and third lines do not appear between the larger orders; because these latter mostly include both rare and common plants, and their averages consequently tend towards a medium figure between the two extremes; although, under special circumstances, considerable differences are found between orders numerous in species.



*Cruciferae* and *Cyperaceae* may be contrasted against *Scrophulariaceae* and *Juncaceae*, as instances of such differences; the former having an average of only 36 repetitions for a species; the latter with an average of 46. The subjoined enumeration of the orders is intended for comparison with that before given on pages 401 and 402. Here, the orders are placed in a series to correspond with the average frequency of their included species. There, they were placed in correspondence with the number of their included species.

- 84. Oxalidaceæ. *Oxalis Acetosella*, the only native.
- 80. Portulacææ. *Montia fontana*, the same.
- 78. Plantaginaceæ. Araliaceæ.
- 77. Urticaceæ. Four species.
- 72. Ilicaceæ. *Ilex Aquifolium* only.
- 66. Dipsaceæ. Jasminaceæ.
- 65. Resedaceæ. Two species.
- 63. Tamaceæ. *Tamus communis* only.
- 62. Celastraceæ. *Euonymus europæus* only.
- 60. Valerianaceæ. Five species.
- 59. Hypericaceæ. Trilliaceæ, or *Paris quadrifolia*.
- 57. Solanaceæ. Convolvulaceæ.
- 56. Verbenaceæ. *Verbena officinalis* only.
- 55. Caprifoliaceæ. Six species.
- 54. Papaveraceæ. Empetraceæ, or *Empetrum nigrum*.
- 53. Geraniaceæ. Fourteen species.
- 52. Polygonaceæ. Typhaceæ.
- 51. Droseraceæ. Three species of *Drosera*.
- 50. Lamiaceæ. Pistiaceæ. Cucurbitaceæ. Aceraceæ.
- 49. Equisetaceæ. Malvaceæ. Lythraceæ.
- 48. Rubiaceæ. Primulaceæ. Onagraceæ.
- 47. Ranunculaceæ. Haloriagiaceæ. Linaceæ.
- 46. Scrophulariaceæ. Filices. Juncaceæ. Alismaceæ. Rhamnaceæ.
- 44. Gramina. Boraginaceæ. Violaceæ. Nymphæaceæ.
- 43. Lycopodiaceæ. Fumariaceæ. Araceæ.
- 42. Umbelliferæ. Callitrichaceæ.
- 41. Compositæ. Caryophyllaceæ. Melanthiaceæ.

40. Leguminiferæ. (General average 41).  
 36. Cyperoides. Cruciferæ. Amentiferæ. Ulmaceæ.  
 34. Euphorbiaceæ. Gentianaceæ. Pinguiculaceæ.  
 33. Rosaceæ. Chenopodiaceæ. Potamaceæ. Ericaceæ.  
     Polygalaceæ. Loranthaceæ.  
 32. Orchidaceæ. Saxifragaceæ. Cornaceæ.  
 30. Crassulaceæ. Berberaceæ, or Berberis vulgaris.  
 29. Marsileaceæ. Two inconspicuous aquatics.  
 28. Iridaceæ. Coniferæ. Thymeleaceæ.  
 27. Grossulariaceæ. Native distribution uncertain.  
 25. Hydrocharidaceæ. Two aquatics; one introduced?  
 24. Amaryllidaceæ. Zosteraceæ. Few species.  
 22. Ceratophyllaceæ. Two submersed aquatics.  
 21. Liliaceæ. Campanulaceæ. Plumbaginaceæ.  
 20. Cuscutaceæ. Parasites, small and austral.  
 19. Tiliaceæ. Santalaceæ. One species each.  
 18. Apocynaceæ. Vinca minor only.  
 16. Orobanchaceæ. Species over-counted?  
 14. Illecebraceæ. Six species; five of them austral.  
 11. Frankeniaceæ. Frankenia lævis only.  
 10. Cistaceæ. Four species; two of them very local.  
     9. Elatinaceæ. Two very small aquatics.  
     6. Balsaminaceæ. Asaraceæ. One species each.  
     5. Eleagnaceæ. Hippophae rhamnoides only.  
     2. Restiaceæ. Eriocaulon septangulare only.

In whatever manner exhibited, ordinal predominance suffices only to give general ideas of the floral and vegetal characteristics of any country. It passably well expresses the prevailing character of the flora, and somewhat less well also that of the vegetation. But this is in truth nature looked at through conventional arrangements in books; and it can accord with and express the truths of nature only so far as those conventional arrangements succeed in doing this; to wit, imperfectly, unequally, capriciously, changeably, — too much modified by the classifying crotchets, and vanities, and rivalries among botanists.

And one constant and insurmountable objection against all such ordinal statistics, when proposed as representations of the realities of nature, lies in the fact above adverted to, that the abundance and prevalence of individual species become more or less veiled, by thus looking at nature through descriptive arrangements in books. If our ordinal statistics are floral, the greater size and frequency of some species are made to count as nothing in the scale. If our statistics are vegetal, the grandeur and frequency of some species, becoming averaged with the smallness and rarity of others, are still made to tell too imperfectly in the joint result. The vast abundance of *Bellis* and *Taraxacum* becomes lost, so to write, by being halved with the rarity of *Diotis* and *Chrysocoma*. And in the order to which those plants belong, the average frequency must be unduly reduced by the book-fiction of doubling the species of *Hieracium*; that is, by segregating them on a different principle from that followed in dividing other genera of the same order into species.

A more detailed idea of the vegetal features of Britain, and proportionally more precise, may be obtained by looking over the 'census of species,' where natural and book species are taken singly, not grouped into orders, and their places in the census list are determined by the frequency of their repetition in the comital floras. Very high in that census list stand the names of *Plantago lanceolata* and *major*, nos. 1 and 11; thus showing a greater predominance in the vegetation, than would be suggested by the low numerical position of *Plantaginaceæ*, no. 38, in the floral census. Not much below them, no. 23, comes *Iris Pseudacorus* in the census list; a position of this species which is not at all suggested by the comparatively low places of its order in the floral census,



no. 48,—in the vegetal census, no. 56,—or even in the series of average frequency, where it stands much below the medium. But such specialties belong rather to the next and following sections of these remarks.

### 5. *Inequalities of Area and Census.*

1. *Floral Diversities.*—No two countries present the same floras or the same vegetation. Always there are species in the one or other of them which are not found in both. And if the floras of two small adjacent tracts do happen to be nearly identical in regard to the species which compose them, the vegetation of the two tracts will certainly differ through inequalities of frequency among the same species. The vegetal diversity may be deemed a rule absolutely without exception, although more or less wide according to special circumstances. And the floral diversity is so usual that it also may be held a rule almost equally true, and applicable to all except very small and closely adjacent tracts.

Floral diversity may be positive or negative. The presence of certain species in one tract, which are not found also in the other tract, is a positive character in its flora. The absence of certain species from one tract, which are found in the other tract, is a negative character of its flora. The diversity between any two floras may thus be positive in both; or it may be negative on one side and positive on the other side; but it cannot be negative in both. For instance, A and B have 1000 species common to both alike; B having also 20 additional species not found in A. Here, the diversity between the two floras is negative in that of A, positive in that of B. But if A could acquire any number of added



species, not known in B, then the diversity would be positive on both sides.

It is conjectured that a distinction between positive and negative diversity, akin to that here made, will eventually prove to be more important in phyto-geographical investigations than has hitherto been made to appear. Differences of this sort are mostly found to be very slight when the floras of two small adjacent tracts are compared together, especially if the tracts are very similar in their geographical features. They become more evident when the flora of one small tract is put in comparison with that of a much larger adjacent tract; the diversity being then principally, if not exclusively, negative in the small tract, positive in the large tract. The diversity is never entirely negative on either side, between two extensive tracts or countries however closely adjacent to each other, or between any two tracts distantly separated, whether large or small;—and in the latter cases, it may perhaps be correctly added, whether the intervening space is terrestrial or oceanic. In such instances, it is believed, the floral diversity will always be found positive for both tracts. And if remote countries are contrasted against each other, the floral diversity becomes sufficiently wide to out-balance the species-identity, so usually existing in excess over the diversity between neighbouring countries.

Floral diversities are found all over the world; varying much in kind and quantity, but everywhere perceptible. Frequently, they may be said to admit of a partial explanation; that is, in so far as the tracing out of some seeming relations with present geographical and climatal conditions can be deemed explanatory of the facts. The antecedent pages of this volume, particularly those containing the summary of distribution and census of orders,

supply numerous facts specially belonging to the botany of Britain, in exemplification of the dissimilarities and distinctions here mentioned. A few of such instances may be cited in further explanation.

The two longitudinal divisions of Britain, eastern and western, are tracts stretching alongside of each other by a wavy boundary line; they are nearly equal in extent, and are so narrow that no part of either can be deemed far distant from some part of the other. The hills attain to nearly equal heights in both; and the extent of coast-line, independently of narrow inlets or indentations of the land, is much the same. These geographic uniformities, and the long line of contiguity, are very favourable to a floral identity. But even with these favouring conditions, the identity is not at all complete. It has been shown by the letters 'w e' in the summary of distribution, that several species are restricted to the western division, and that several others are in turn restricted to the eastern division; the united floral diversity amounting to fourteen per cent of the whole flora, or thereabouts.

In the three latitudinal divisions, south, middle, north, the floral diversities become more numerous. It is shown by the letters 's m n' in the summary, that each of these divisions contains several species which are absent from one or both of the other two divisions. The floral diversity here becomes increasingly evident if South Britain is compared with North Britain; although the interspace between them is not very wide. Each of them produces some species which are not found in the other; the positive diversity, or added species, being considerably more numerous in the southern division than in the northern division. So, again, on comparing the Isle of Wight and the Orkney Isles, two smaller and

more widely separated spaces, the floral diversity becomes correspondingly wider; far the greater number of the Vectian species being unknown in the northerly group; and several of the Orcadean species being in turn absent from the southern isle.

But if we set Orkney against Scotland; that is, a small space against a much larger tract, we shall then find all the species of the small space repeated in the larger tract, along with numerous additions. The diversity here is entirely negative for the Orkney flora, and of course entirely positive for the Scottish flora. A considerable amount of floral identity remains amid the diversity; that is, all the certain species of Orkney are identical with some among those of Scotland. A submergence of the entire group of Orkney Isles would not deduct a single species from the British flora. This would not be quite the case with the more distant Shetland group; two seeming species, or strongly marked varieties, being found in Shetland, and not elsewhere in the British Isles.

Enlarging upon the last comparison, the smaller adjacent island of Ireland may be set against that of Britain proper. Nearly the whole flora of the former is found repeated in the latter; the small exception in the Irish flora constituting its positive diversity, and not counting up to a score of clearly admitted species. But the flora of Britain, the larger tract, includes some hundreds of species which have not been seen truly wild in Ireland. This diversity, it should be noted, is not at all confined to the species of North Britain, which is situate out of Irish latitudes.

Again rising to larger tracts, a similar comparison may be made between Britain and Europe. It has been stated before, that there are extremely few certain species of the former, which do not occur somewhere in the latter;



although a much wider European area would require to be taken under view in order to bring all the remaining British species within its limits, after excluding the few not certainly known to occur anywhere in Europe. And as some of these few are elsewhere found in America only, the extra-britannic area, large enough to include repetitions of all the British species, is a very wide one indeed; even supposing that no true species is absolutely and exclusively restricted to these islands.

2. *Distributive Diversities*.—In the lists printed on former pages of this volume, having reference to the areas and census of species, inequalities and other diversities of distribution appear to be almost as numerous as the species themselves. Arrangements of the plants might be made, and some of them have been made, according to latitude,—according to longitude,—according to altitude,—according to climate,—according to provinces,—according to counties, &c., &c. None of the groups so formed would exactly correspond with each other by the species included in them. Those plants which agreed in one character of their distribution, would be found to differ in another; those which might be placed together in some of the groups or arrangements, would be separated in others. The floral diversities between different countries, or between different portions of any single and separated country, are inevitable results of the existing inequalities of distribution between species, such as have been already enumerated and shown specially for Britain. It would perhaps be more correct to say, that they really are those inequalities themselves, brought under notice, and variously apportioned, through the customary manner of dividing the earth's surface into sections, political and geographical.



The areas of some of the native plants of this island have been shown to extend over its whole length and breadth; the plants being found in every province and sub-province, under every degree of latitude and longitude. Others are seen only in single provinces or sub-provinces, or are restricted to still smaller sub-divisions. Between the two extremes, between the most local and the most general areas, all intermediate grades of partial distribution can be traced. Between 1 province and 18, between 1 sub-province and 38, between 1 county and 99, every intermediate figure has been shown to be applicable to some of the plants; for instance, by the census figures on pages 271 to 273. And under each degree of latitude, and in each province, some species find their north or their south limits, as shown on page 321, &c. All these are examples of inequality in distribution.

What is thus true of Britain as a whole, is true also of subordinate portions into which it may be subdivided, perhaps with certain small local limitations not relevant just now. And what is thus true of Britain in particular, is true of the whole earth, and of any other of its geographical divisions; but with certain highly important limitations, as, for example, in the fact that no species can be held general to the whole earth, though so many may be called general to the whole surface of Britain horizontally, or to the whole surface of tracts more extensive than this island.

It cannot be necessary to cite facts by way of proving that such inequalities of distribution prevail on the large scale, as well as locally in Britain. But not to leave this only an abstract statement, the unequal areas of some of the plants may be briefly mentioned in example of it. The area of *Calluna vulgaris* is widely extensive; this familiar shrub being spread over a large portion of

Europe, and continued into Asia. The area of *Erica cinerea*, the frequent associate of the *Calluna* throughout Britain, is more contracted in Europe; stopping far short of Asia. The area of *Erica ciliaris* is still more contracted; being only a comparatively small portion of south-western Europe, namely, Britain (including Ireland?), western France, Spain with Portugal. The area of *Erica umbellata* is again smaller; being a portion of the Spanish peninsula only.

In addition, it is to be kept in recollection, that the geographical position of the areas, relatively to each other, is quite as varied as their dimensions. The smaller areas of some species may be wholly included within the larger areas of other species, and in different situations within them. The areas of some species are situate wholly or partially more northward, more southward, more eastward, more westward, higher or lower, than the areas of other species; being either quite separated and apart, or else intruding one upon another in the most varied modes and degrees. Some species range along the shores or near the coasts only; while others are quite inland; and others occupy both situations. Moreover, the continuity of distribution may be interrupted more or less within the area, regarded as a whole space. And great inequalities of profuseness or rarity may exist between species, although the extent of their geographic areas, and even their continuity of distribution may not very widely differ. In short, the often-cited simile of rain-drops on a pool of water,—the circles of which cross and interfere with each other almost infinitely as they widen,—might be applied to the areas of plants, as it has been to so many other things.

This enumeration of inequalities and diversities would read like an idle repetition of trite truisms, were there

not an end to be arrived at thereby. It is a certain result of these varied conditions and inequalities of distribution, that on taking any part or section of the earth by itself, any single kingdom or country, any belt of latitude or longitude, the areas of the plants are unavoidably cut asunder and separated in the most unequal manner and degree. Geographic arrangements and nomenclature thus somewhat arbitrarily multiply and increase the natural inequalities by cutting off fragments, so to say, from the areas of many species, and making them portions of different geographical areas. The area of one species not corresponding with the area of another, by geographic position or extent, each separated country must include unequal portions of the whole geographic areas of its plants.

Britain appears to have been cut asunder from Europe and much abraded by the encroaching ocean, which may be said to have left in this island only a small portion of the area of *Cyperus longus*, — a larger portion of the area of *Clematis Vitalba*, — a still larger portion of the area of *Tamus communis*, — again, a yet larger portion of the area of *Plantago media*, — and a much larger portion, equal to the whole island, of the area of *Festuca ovina*. The restricted distribution of many species in this country, and their consequent low places in the census lists, arises in the manner here set forth; although, no doubt, other conditions have also to be taken into the account, over and above the mere extent of local area, so cut off from the rest of the geographical area for the same species. Sparseness of distribution, and interruptions to continuity which leave wide interspaces between special localities, are among the conditions which tend to lower the census of species. Even these conditions themselves are often closely connected with the severance of areas, through



the tendency of species to become less plentiful towards their areal limits, as noticed below.

3. *Geographical limits of Species.*—As no flowering plants are distributed over the whole earth, the areas of all may be said to have terminal limits, geographical, climatal, &c. Phyto-geographers have endeavoured to trace out a correspondence and connexion between the areas of species and the lines of latitude and longitude marked on maps; and also to connect the boundaries of those areas with lines which are believed to represent similarities of climate, or other conditions of physical geography. An incorrect idea is in this manner fostered and promulgated, that the limits of plants are abruptly bounded, and that they can be properly represented by lines traced upon maps. This is so imperfectly true, as to be almost false. Who has ever found such lines in England? Who has ever discovered or traced out any such lines on the actual land, or in the actual vegetation, in any part of the world? Notwithstanding the statements and representations of those who make books and maps at home, the botanists who look out upon the realities of nature, seldom or never find the limits of species running in lines.

The usual manner of distribution and cessation is quite different. The whole area of a plant being under view, its special localities are usually found to be most approximated and most productive about the middle of its range, either of latitude or of elevation. The middle of the range may be near the centre of the area, or not so; and the two expressions are therefore not to be held synonymous. No very confident assertion can yet be made on this point, from want of sufficiently clear and precise data respecting the census of plants beyond



Britain. But it is inferred from the imperfect data attainable, that species are not always, and perhaps are not usually, most abundant at the centre of their areas. Understanding the geographic area of a plant to signify the whole space of terrestrial surface, over which it is diffused more or less continuously, that area will include certain ranges of latitude and longitude,—of climate, under its manifold proportions of temperature and humidity,—of altitude, both absolute and relative,—of maritime proximity and remoteness, &c. Such ranges may be mentally conceived and represented as linear or catenarian. On the contrary, the area of a plant must have width as well as length, and should be mentally conceived as more or less approximating to a square form, occasionally rounded, occasionally elongated.

It is suggested for further examination, that many of the British species are most abundant on the western side, rather than towards the centre, of their present (curtailed?) geographic areas. But looking on the western side of their areas, and considering it as a line traced from south to north, or reversely, the species may perhaps usually be found most abundant and best developed near the middle of that line. To this no doubt many seeming exceptions might be pointed out; because the linear range of altitude will cross and interfere with that of latitude; and some other conditions also come in to modify the single one of latitude.

Whatever may be the place of greatest abundance of a species, and closest repetition of special localities for it, the localities usually become more and more disjoined, and often less productive also, in proportion to distance from that place. Gradually it becomes a "rare plant," appearing only in few spots, with wide interspaces; and those few spots probably producing few individual exam-

ples of the species. In this manner plants gradually attenuate their distribution into isolated spots on the outskirts of their areas, like so many advanced points or positions, beyond which the same species is no more seen. Occasionally, these outlying localities are so far distant as to seem quite disconnected. This is more particularly the case with alpine plants, where the mountains on which they grow are disjoined by wide interspaces of low country, having a climate unsuited to alpine plants, and a larger vegetation among which such plants would vainly struggle to hold their ground.

It is that tendency of species to attenuate into small detached localities, as they approximate towards their vanishing points, which is difficult to represent correctly to the eye on paper. Dots would do this more correctly than lines. But maps ordinarily bear so very small a proportion to the actual geographical surface, that visible dots on them must often unavoidably exaggerate the localities, and minimize the interspaces, into very disproportionate representations of the truth. And when lines are traced upon maps, so as to connect the outlying localities, they falsely seem to represent an abruptness of limit, and to enclose a continuity of area, neither of which has any real existence. On the other hand, if the most separated and outlying localities are not taken in, the line is then drawn too short of the actual range and limits of the species. Lines must thus enclose either too much or too little.

The same tendency towards detached points of cessation, by isolated and small localities, often renders it matter of much uncertainty at what particular latitude, or at what particular elevation, species should be stated to cease or to commence. In many cases it is not an easy matter to make sure that the most boreal or most

austral, the highest or the lowest locality has really been ascertained. And in a country like Britain, where man has so much intermeddled with nature, there is too frequently a further uncertainty whether the most outlying localities ascertained are natural or artificial, unaltered or altered by human agency. Admitting the nativity of *Viola odorata*, *Vinca minor*, *Daphne Laureola*, and various other plants frequently kept in gardens, their present most northerly localities in Britain are certainly not native stations; and who can now say with any confidence, at which of their localities the natural limits of their areas or ranges are to be fixed?

4. *How are the inequalities of distribution to be explained?*—The census of species was founded primarily on the 38 sub-provinces, and secondarily on the 112 comital (including therewith the vice-comital) sections. If complete floral lists could be obtained for each and all of the 112 sections, the names of many of the species would likely be preceded by that figure instead of 99, as the highest figure in the comital series; the first group in the general census list then graduating from no. 112 downwards; the second group from a higher no. than 94; and so on. But taking that list as it now stands, with the commonest plants made to seem less generally distributed than they truly are, through habitual neglect of them, it still suffices to show very wide inequalities in the areas and diffusion of the species.

Although this fact had not before been brought into view so decidedly and clearly by a series of numerical figures, every young botanist has early in his studies become familiar with the general idea, that some such inequalities do exist. He has at any rate acquired some vague notions about "rare" and "common" plants. And



unfortunately for phyto-geographical science, he has too usually learned also to despise and disregard these "common things," in an acquired taste for rarities, more fanciful than philosophical. To the phyto-geographer, however, the commonest plants can remain sources of interest and objects of research, indirectly through their localities and ranges, equally with the rarest kinds, in searching for which botanical collectors evince so much ardour.

The thoughtful observer of nature takes longer and deeper views. He seeks an answer to the question, whether those inequalities of rarity and frequency, of wide and restricted distribution, are simply fortuitous?—whether they are related by causation or otherwise to known differences in the present physical geography of the island? More than this, he may extend his investigations so far as to seek out other and remote explanations, drawn from ascertained facts and probabilities in the past history of the earth, or of Britain by itself; with less remote explanations traceable through the history of human operations within Britain. The most advanced phyto-geographers yet stand only at the site of some future edifice; they are still at the beginnings of such investigations, and they can see the explanations only in a disjointed and very incomplete form. Sufficient is seen, however, to warrant a belief that the present distribution of plants is not accidental, but is the result of past geographical or geological changes and present adaptations. Chiefly of the latter?

It is true, several of the species now appear dotted about Britain in a manner which it seems very difficult or impossible to account for. We are unable to say how the plants got into their present localities, or why so many of them remain there, year after year, century after century,



without spreading more widely, or without visibly contracting their areas, where left undisturbed by man, the great intermeddling agent of nature. Not unlikely, however, this non-changeability in the limited localities of some species is more seeming than real, the deceptive inference from a brief and imperfect observation.

The larger number of species may be said to evince a tendency towards continuity of diffusion, interrupted or arrested in such places, and under such conditions, as may fairly be considered more or less satisfactorily to account for the facts observed. For example, on finding various species upon the higher mountains of Scotland, which are absent from the low and comparatively warm plains and coasts of Britain to the southward of those mountains, and which are known again on the plains and shores of arctic countries, — the inference in this case is obvious and irresistible, that the cold and humid climate of the Scottish mountains is one of the present related conditions, assisting to preserve and keep the plants there; although not sufficing by itself to explain how they originally got to that locality.

Again, *Primula scotica* is found in some few places near or along the northern coasts of Scotland, but not spreading to similar situations more southward, nor rising to the higher mountains. Though sufficiently puzzling still, this very restricted area in Scotland was yet more inexplicable so long as the same species was believed to occur in no other country. Since it has been ascertained to occur also on the mountains of Scandinavia, a plausible conjecture can at any rate now be made, that it has emigrated from those mountains to the moorland coasts of Scotland, — and that some peculiar adaptation to soil or climate, or possibly the want of sufficient lapse of time, may have prevented the extension of

this species farther southward, and to the Highland mountains where many of its Scandinavian alpine associates find their congenial abode in Britain.

At the other extremity of this island, *Sibthorpia europæa* is found in some few of the south-western counties; also, *Erica ciliaris* still more locally there. On removal to inland gardens in the south-eastern counties, these plants will die away during dry summers, unless watered or sheltered; and they are occasionally killed by frost in severe winters. Here, again, the inference seems clear and warranted, that the damp and equal climate of the south-western counties is a related condition of their existence there; the inference being further supported by the fact of their occurrence under similar circumstances elsewhere in western Europe. But this apparent adaptation specially to the present climate of their localities, gives no explanation as to the agencies which originally placed them there.

A first call on the phyto-geographer is to ascertain where the plants are now distributed, and in what manner and degree such present distribution accords with present geographical conditions;—how it appears related to latitude and longitude, to elevation and climate, to soil and situation, to continuities and disjunctions of the earth's surface, &c., &c. The ingenious minds, that take their delight in inventing causal hypotheses to account for these present seeming relations, through reference to supposed conditions of the past, will work more easily, and perhaps with more truthful results, if supplied with properly arranged data truly illustrating the present. They may then possibly find out, instead of only feign, phyto-geographical and phyto-geological histories.

Hitherto, such data have seldom been better than vague and partial; never exact and complete. Any

crude hypothesis may appear supportable and to be supported, while its proposer feels himself free to select a small number of species in example of it, and to ignore all the rest. It may so appear, because he naturally selects in preference those which accord with his hypothesis; or (as in one late instance) deceptively culls out those which can be so stated as to seem accordant with it.

The more legitimate course for a truth-seeker, and the one better calculated to lead to sound theories eventually, is that of including all the species of a flora; placing all of them fairly under the same arrangements; looking on all alike under the same tests and aspects; so that any exceptions may become equally apparent as confirmations; opposing facts be shown as clearly and prominently as the supporting facts. This would be the scrupulous and philosophical course of proceeding;—but it certainly has not been the usual course with the framers of phyto-geographical or phyto-geological hypotheses. There are honorable exceptions, it is true; and among the commendable and reliable treatises, under this aspect, may be mentioned the writings of Professor C. Martins,—morally so unlike those of a late Professor in London.

And here, friendly reader, you may now find a reason for the full lists of species and of orders, several times repeated in this volume, under different arrangements. Lengthy as it renders them, the completeness of the lists is needed as a safeguard against the picking and culling of facts in support of unsound hypotheses, and the ignoring of those which might suggest a contradiction. While the repetitions serve to place the same species or orders under different aspects and combinations, applicable to more various purposes than any single enumeration could possibly have adapted them for.



### 6. *Local Species.*

Subject to the remarks in the preceding section, on the areas and limits of plants, many of the inequalities of distribution in Britain may be conveniently traced, and in some degree also explained, in connexion with the geographical divisions of the surface by lines of latitude and longitude, or with elevation above the sea-level. This has been exemplified in some detail by the lists and tables printed on preceding pages, and will receive some further elucidation a few pages onward.

But many of the plants are either too local or too general, to exhibit any limitary connexion with latitude or longitude. A species distributed through the entire length and breadth of the island, and passing probably to other countries northward and southward of Britain, cannot be said to have such limits here. And on the contrary, some of the plants which are restricted to a single province or two, or even smaller sections of surface, may have their very local distribution related to other conditions more closely than to lines of latitude or longitude. If special lists of the most local plants should be required for any purpose, they can readily be made out either from the 'census of species' or from the 'areas of species.' In the former, they stand together at the latter part of the list, as species peculiar to a single sub-province, or to two or three sub-provinces. In the latter, they are more scattered; but are still easily distinguished by the single or few provincial nos. set after their names. Looking to the last group of the census, the 77 plants restricted to a single sub-province may be apportioned between the divisions of Britain thus:—

South Britain, 44.      Mid and North Britain, 33.

Or, looking to the ternary division, which disjoins



Scotland from England, and distinguishes the latter into western and eastern, the figures will reckon up thus :—

W. England, 30. E. England, 22. Scotland, 25.

These last three figures would be reduced to 26, 21, 18, by omitting five segregate or spurious species of *Rubus*, and seven such species of *Hieracium*. Turning to the group of 54 species apparently restricted to two sub-provinces, the figures come out thus :—

South Britain, 34. Mid and North Britain, 17.

To which three other species must be added, as common to the two divisions, namely, *Hieracium lasiophyllum* and *Rubus Bloxamii*, with the *Eriophorum gracile*, not quite certain in the North of England. Again, by the ternary division, the same 54 plants are found distributed thus :—

W. England, 11. E. England, 22. Scotland, 12.

With nine others common to two of the three divisions. So far, it appears that among the 131 very local plants those of South Britain are considerably in excess over those of North Britain. According to the first comparison the very local plants of England are more numerous on the western side ; but by the second comparison, that of plants ascertained in two sub-provinces, the western excess of the first comparison is found to be compensated by an eastern excess in the second ; the united numbers being 41 and 44.

Turning next to the 'areas of species,' those indicated by the single nos. set after their names, as being apparently each restricted to a single primary province, are apportioned among the provinces in the following numbers :—

Peninsula .....	19	Channel .....	11
Severn .....	6	Thames .....	14
South Wales ....	2	Ouse .....	15
North Wales ....	4	Trent .....	1
Mersey .....	2	Humber .....	4
Lakes .....	0	Tyne .....	2
West Lowlands	0	East Lowlands	0
West Highlands	1	East Highlands	27
North Highlands	1	North Isles ....	2

The 111 species presumed peculiar to single provinces on present knowledge, are thus seen to be apportioned very unequally among them. The provinces are here first arranged into western and eastern, and are then enumerated from south to north. A glance suffices to see that local plants are most numerous in the southern provinces, as was shown above by the subprovincial comparisons. To this austral tendency of the local species the East Highlands offer a decided exception, arising out of the many alpine or arctic plants which have been found hitherto only in that one large province. Eight of those so reckoned up are segregate species of *Hieracium*. And it is likely that some among the total 27 species might be found also in the West or North Highlands. Still, even if subject to some abatement in regard to the precise figures, it is made very evident that the most local species tend in three directions; namely, to the south-east of England, to the south-west of England, and to the Highlands or mountains. In other words, the very local plants are australs and arctics, with some very few others scattered elsewhere.

But in taking those of single provinces as the most local group of plants, some few equally local species are excluded from consideration. A species found in two

localities, one on each side of a provincial boundary line, might be held equally local with another species found in two distinct localities within the same single province. For example, *Myosotis alpestris* is an extremely local plant in England; but it is placed both in the eastern and western floras, in the provinces of Humber and Lakes, because its one locality is stated to be crossed by the provincial boundary line. And through this peculiarity, the plant is deceptively made to appear more frequent in England than in Scotland, if the census is taken by provinces or sub-provinces, or even counties, as shown on pages 267, 309, 335.

#### 7. Relation of Plants to Longitude.

In the higher latitudes of the northern hemisphere various plants may be said to surround the globe with zones of the same species, diffused more or less continuously amid the general mass of vegetation; but their localities not widely dissevered anywhere, except by the oceans which intervene between the old and the new continents. Everywhere, intermingled with such widely-spread plants, others also occur which are more restricted in their diffusion, and which successively displace one another, or are substituted one for the other; thus constituting different combinations of species, or native floras, in every country and considerable space of surface.

In the warmer latitudes, and in the austral hemisphere, the floras present less of the specific identity, more of the substitutions, under different longitudes. But with those distant lands and dissimilar floras this present treatise has no concern. To understand the flora and vegetation of Britain, it is not necessary to pass many degrees far-



ther southward than its own latitude. And as we go northward the cessation points of species are attained and left behind in rapid succession. But no botanist will sufficiently understand the botany of Britain, and the relations of its flora in the general system, without a fair knowledge of European botany between latitudes 40 and 70, and some small knowledge about that of Asia and America in latitudes nearly corresponding therewith, or somewhat more boreal.

If we should trace round the globe within any given range of boreal latitude, whether that of Britain itself or some other not far distant, we should find a change in the flora gradually increasing as we receded from our starting point, and thus increased our longitudinal distance. Species after species would disappear; and their vacated place in the flora would become occupied by other species, successively appearing, and serving as their substitutes or representatives. But great as the total difference eventually becomes, and numerous as the substituted species are found to be, it seems impossible to point out any line or parallel of longitude; and to say that there in particular the floral change occurs. Mountain masses and oceanic spaces may no doubt make the changes appear more abrupt; but in such cases it is of course to these other conditions of physical geography, and not to longitude simply, that we must look for the related explanations.

Less of the changes alluded to are observable in very high latitudes, where the longitudinal circumference of the globe becomes much shortened under equal latitude; where the climate becomes more similar under different longitudes; and where the polar centre may be held a common vanishing point of distribution. But as we pass from arctic into more temperate latitudes those conditions



become altered; the floras undergoing greater proportionate changes from east to west, or from west to east.

The specific differences are numerous, and usually much in excess over the identities, when the floras of the two opposite coasts of an intervening ocean are compared together, as those of Europe and America. The same holds true also when the floras of the contrary sides of a wide continent, very dissimilar in climate, are compared together; those of Europe and China, for example. But even on those dissevered coasts, or those distant lands and dissimilar climates, where only a smaller number of the species are found to be identical, there is still usually much resemblance between the floras of corresponding latitudes, through an ordinal and generic identity, although not become (rather, perhaps, not continuing) so close as to be deemed specific identity.

Britain is not an exception to the prevailing rule of change or difference longitudinally; although this island by itself is a longitudinal fragment of the globe too small and narrow to show much difference in its native flora on the two sides of the island. And the floral differences which do appear are perhaps chiefly attributable to oceanic influences, and to the oblique position of the island with relation to the continent of Europe. The largely prevailing identity of the western and eastern species has been already repeatedly mentioned. It has been shown in the summary of distribution, by the paucity of small lines, instead of the letters 'w e.' And in the latter portion of the census of species it became apparent that the non-correspondence between those of the west and east was slight comparatively with the total number. According to the table on page 364, the numerical values of the western and eastern floras are summed up thus :—

West Britain, 1305 species. East Britain, 1355 species. Deducting these figures from the total flora of 1425 species we find the difference between the two longitudinal floras thus :—

Western exclusively, 70. Eastern exclusively, 120.

And putting the figures under another aspect, we have the dissimilarities between the floras for East and West Britain thus :—

Numerical difference, 50. Floral diversity, 190.

And looking to the eastern and western divisions of England, apart from Scotland, the floral numbers are reckoned up from the 'census of species' thus :—

Scotland, 1015. W. England, 1245. E. England, 1270.

So that the true numerical difference between the eastern and western floras of England, when the local plants of Scotland are left out of count, amounts only to 25 species. The floral diversity is of course greater.

In all such numerical estimates and comparisons, it is constantly to be kept in recollection, that the seeming preciseness given by the use of arabic figures is not quite real. The numerical predominance of the flora of England over that of Scotland, the like predominance of the flora of either longitudinal half of England over that of all Scotland, and probably the slight predominance of the eastern over the western flora,—each of these may be held a fact or real knowledge. But the particular figures given for the excess are at best only approximate and variable. More exact knowledge of localities will always tend to alter the numbers, one way or other, and more usually in diminution of differences. The greater or less aggregation of sub-species into species, or the reverse process, will operate more decidedly in variation of numerical summaries. And beyond these causes of change, there still come in the conflicting views about nativity

of species, tending to induce further uncertainty in the figures.

It is not unlikely that the number of Scottish species may appear to the botanists of that sub-kingdom as being too much reduced below the number for England. The reputed flora of Scotland (here made only about equal to that for the single English county of York) has been somewhat lowered in a manner which may require explanation. Several of the truly native species of England occur in Scotland only as doubted natives; and some of the denizen species of England are more evidently aliens in Scotland. In reckoning up the provinces and counties for such plants, and in deciding on their boreal limits, the very uncertain line of separation, where the native or denizen becomes an alien species, has been conveniently drawn between England and Scotland; thus giving a somewhat greater abruptness in severing the floras of the two sub-kingdoms than elsewhere appears between minor divisions and sections of the island. In example, *Viola odorata* and *Vinca minor*, with various other species, have been reckoned in the summaries for eastern and western England; not so for Scotland, although often mentioned in Scottish floras as if natives, but too usually on slender grounds and on no reasons.

It has appeared from the census of species, that so many as 57 (or 55) are yet known only in single counties or vice-counties; that 77 (or 75) have been clearly ascertained in single sub-provinces only; and that 111 species are thus limited to single primary provinces; also, that various other species are restricted to two or three of such sections of Britain. The question will here rationally arise, whether some of these species may not be exclusively western, or exclusively eastern, by the accident of their very restricted areas or localities, and not



from any special adaptation to the eastern or western climate, or to such a geographical position ?

Likely enough this question might be answered affirmatively, if we were enabled to ascertain the origin of these species in their present localities, or should try the experiment of naturalising them on the other side of the island. *Cotoneaster vulgaris* and *Potentilla rupestris* are established and reputed native in single localities in North Wales. *Draba aizoides* and *Dianthus cæsius* occur in single counties farther southward on the same western side of Britain. All four will thus find place in any list of species exclusively western. And yet it seems difficult to point out any peculiarity in the technical or physiological characters of these four plants, in their climatal requirements, or in their distribution on the continent of Europe, which will account for their exclusively western abode in Britain. On the contrary, antecedent expectation might have deemed them equally or even more likely to occur in the eastern provinces. Perhaps the rupestral character of their localities, or else the qualities of the rocks on which they grow, may be the nearest explanation towards accounting for the western restriction of these four plants in Britain ; and this may be so, whether they ought to be held native or naturalised there. Under this view, their exclusively western position may be considered a geographical accident, connected with strictly topographical circumstances, and not with longitude.

In direct counterpoise to those four western species, an equal number of others may be cited as found only on the eastern side of England, although antecedent expectation might have placed them on the western side instead ; namely, *Frankenia levis*, *Dianthus prolifer*, *Isnardia palustris*, *Digitaria humifusa*. These four eastern-English species are less local than the four western-English



species mentioned above; and their longitudinal limitation is therefore more marked. Now, on turning to the Channel Isles, Jersey and Guernsey, all these four eastern species are still found; while the four western species are absent from those Isles, although the Isles are rupestral in character, and occidental in position and climate. The same holds true in continental Normandy, according to Brebisson's *Flore de la Normandie*.

It may also be remarked, when the total flora of Britain is under consideration, that several of the exclusively eastern species are simply very local alpine or arctic, found in the East Highland province, but hitherto not detected on the less-examined mountains of the West and North Highlands. In respect of actual longitude, and in general climate, the East Highlands are almost equally western with North Wales and the Lake province; especially so if the mountains are under consideration, not the coast-line. It is not a very scientific mode of expression, to repeat that various very local plants of England or Scotland are accidentally eastern or western, not necessarily so; and yet it seems allowable to say this, while attention is specially directed to longitude, apart from other conditions of physical geography.

The truest list of western and eastern species would probably be made out, by selecting them in accordance with any decided predominance on the one side, although not absolutely restricted thereto. Such lists need not include the very local plants, quite absent from one side of the island; because these would still not show any prevalence on the other side. The 'census of species' affords the data for such lists, that is, so far as differences in the sub-provincial figures may be held evidences of predominance, and the reverse. Space sufficing, the subject of eastern and western species will be again adverted

to under the types of distribution, and may be dismissed for the present.

#### 8. *Relation of Plants to Latitude.*

In tracing along the earth from north to south, or in the reversed direction, within any given range of longitude, far wider floral changes may be observed than those alluded to in the preceding section. A successive appearance and disappearance again occurs; but it is effected more rapidly and more completely. A change of less than seventy degrees in latitude, from equator to arctic circle, or from polar to tropical lands,—one-fifth round the globe in latitude,—may be said to give almost a complete change of species, on the low plains and shores, and not far from a complete change of genera; with very wide changes also in the numerical values and proportions of orders. These floral changes are much greater than those which correspond with a longitudinal change amounting to one-fifth of the circumference of the globe.

Within the small area of Britain, as before stated and shown, the floral changes in connexion with latitude also much exceed those in connexion with longitude; the usual excess in one direction being probably augmented in Britain through the elongated form and irregular outline of the island. In the 'summary of distribution' and 'census of orders,' pages 175 and 362, three latitudinal divisions are made, with the purpose of giving a middle and two extremes; the triple comparison better sufficing to show a gradation of difference; the comparison between two divisions serving only to show a single difference. But it was stated that no such three-fold division could be suitably made in connexion with longi-

tude ; and we can therefore only compare the result of a binary division in the one case, with the results of a ternary division in the other case. Ireland was indeed added, as a third and more westerly one, to the two longitudinal divisions of Britain proper, though without admitting of any just comparison between their three numerical totals ; the more westerly island being separated by an intervening sea, having a much-restricted latitudinal extension, and not having hills of equal elevation with those of Britain ;—conditions likely to affect the flora much more than the difference of longitude simply by itself. Though still open to some objections, the ‘census of species’ yields better data towards showing that latitude operates greater floral changes than longitude.

The effect of the geographical differences before noted between the three latitudinal divisions, pages 135, 136, is an augmentation of the natural changes induced in the flora by difference of latitude. In general terms,—not subject to much exception, while considering an area so small as Britain,—it may be said that difference of elevation affects the flora in a manner very similar to difference of latitude. Thus, the larger surface of low and open country in South Britain, and the larger surface and higher elevation of the mountainous ground in North Britain, tend to increase the differences between their respective floras ; and perhaps more particularly so in respect to the non-identity of species. The addition of arctic species to the mountain flora of North Britain, such as occur on low plains only in latitudes farther northward, must in part compensate numerically for an earlier termination of some of the more southern species, brought about by the repelling influence of the northern mountains on such plants ;—thus augmenting the posi-



tive floral diversity, by changing the species more, while less altering their numbers.

It appears by the 'census of orders,' that the numerical values of the three floras run thus :—

S. Britain, 1280. Mid Britain, 1148. N. Britain, 930.

Or, putting the comparison into another form, it may be stated that, out of the total flora of Britain, the number of species absent from those three latitudinal divisions are these :—

S. Britain, 145. Mid Britain, 277. N. Britain, 495.

It will be kept in recollection, that these are not comparative estimates between the floras of different countries, as described by different authors, and consequently varied unequally by individual views about species and nativity. They are here made between the several floras of three divisions of a country well examined by many botanists, and which are brought closely to an uniform standard in respect to the distinctions between species, and those between native and introduced plants. In this wise they are good data towards illustrating the influence of latitude, slightly augmented by that of elevation.

The segregate species of *Rubus*, it is true, are not so well ascertained for North Britain, as for the other two divisions ; and on the whole, the flora of that division is less fully known than are the floras of the two more southerly divisions. As a partial set off against this numerical deficiency, it may be said that the flora of North Britain is unduly increased by counting in it a larger number of segregate species of *Hieracium* ; especially so, if compared with the flora of South Britain. The boreal and montane genus *Hieracium* is thus made a counterpoise against the austral and lowland genus *Rubus*.

In the 'census of species' only binary divisions of latitude are taken into account ; South Britain against



Middle and North Britain united ; East or West England against Scotland. The statistical comparisons being there made between the numbers of the sub-provinces, it was desirable to adopt such a line of separation as would place them in two groups equal in numbers. And it will be recollected that the desired equality was obtained by combining those of Middle and North Britain, with the exception of Lincolnshire being added to South Britain ; and so making the numbers into 19 south and 19 north. Including this slight change in the sub-provinces, it appears by the blanks in the first column of the census, that the number of species peculiar to the two divisions run thus :—

South Britain, 209. North and Mid Britain, 139.

And next, by deducting these numbers from the whole flora of Britain, we find the numerical values of the two several floras thus :—

South Britain, 1286. North and Mid Britain, 1216.

On making like comparisons between England and Scotland, founded on the 'areas of species' and on the third column of figures in the census, the number of species peculiar to one or other sub-kingdom appear thus :—

England, 410. Scotland, 74 or 75.

And the numerical values of their total floras,—ascertained in each instance by deducting the absent species from the whole flora of Britain,—according to the same list, appear to be thus :—

England, 1350. Scotland, 1015.

It has previously been explained, page 450, that the number of species so attributed to Scotland may perhaps be deemed too low by those botanists who are more solicitous to extend floral lists numerically, than to eliminate from them the distrusted natives. The like explanation might also be applied in some degree to the line of

separation between the floras of Mid and North Britain, as well as to the line between those of England and Scotland; certain species which are found under distrusted conditions in the latter division, being reckoned in the list for the former division only, and not admitted among the native plants northward of the estuaries of Clyde and Forth.

In accordance with the northerly decrease in the total flora, most of the orders exhibit a decreasing number of species in the same direction, when the ternary figures in the middle column of the 'distributive census' are compared together. The rate of numerical decrease northwards is very unequal among the orders. Thus, *Compositæ* appear to decrease by very few species in proportion to their total numbers; being only one-eighteenth of the whole, or 6 out of 108, the north compared with the south. The absence from North Britain of various English species of that order, is compensated there by the accession of many alleged species of *Hieracium*, and some species of other genera among the alpine or arctic plants. On the contrary, *Umbelliferae* decrease more decidedly, *Chenopodiaceæ* and *Euphorbiaceæ* still more decidedly, from south to north.

In the list referred to, *Rosaceæ* and *Leguminiferae* appear on equality by actual numbers in North Britain; but in South Britain the former order is one-seventh more numerous, chiefly through the genus *Rubus*, the segregate species of which have not been so much recorded for North Britain; where, indeed, several of them may likely be quite absent. *Filices* and *Orchidaceæ* are numerically equal in South Britain; becoming less equal in Mid Britain, and very unequal in North Britain. *Lycopodiaceæ* and *Plantaginaceæ* show even numbers in all three

divisions; this equality of actual numbers being relatively an increase in the northward direction, since the orders remain equally numerous in a diminished total flora. In *Boraginaceæ* and other instances, where some decrease is seen, it is so slight as to be also a relative increase. And in some few orders there is an absolute increase in the number of species northward; *Amentiferæ*, *Juncaceæ*, *Ericaceæ*, *Saxifragaceæ*, *Equisetaceæ*, with two or three smaller orders, being examples of a northerly increase. *Nymphæaceæ* are among the lesser orders so appearing in the list; but if true *Nuphar pumila* does occur in Shropshire and Northumberland, the three species belong alike to all three latitudinal divisions.

In very few instances does an order exhibit the largest number of species in Mid Britain; though *Primulaceæ*, *Grossulariaceæ*, *Caprifoliaceæ*, *Melanthiaceæ*, and *Cornaceæ* appear in the list as examples of this peculiarity. It is attributable to the commencement or appearance of added boreal species before an equal number of southern species have ceased. *Grossulariaceæ* may or may not be held such an example, according to varying views about the nativity of the species of *Ribes*. The three succeeding orders are increased in Mid Britain by the single species, *Linnaea borealis*, *Cornus suecica*, and *Tofieldia palustris*; which extend sparingly into that division, and fail to reach South Britain.

The number of orders unrepresented by species in the three latitudinal divisions may be stated thus:—

S. Britain, 1. Mid Britain, 4. N. Britain, 19.

The four orders wanting in Mid Britain are also among the nineteen absent from North Britain; the twenty orders in the whole being represented only by single genera in our truly native flora, unless *Araceæ*, *Amaryllidaceæ*, and *Hydrocharidaceæ* are correctly to be excepted from that



singleness. If the slightly suspected *Leucojum* (by several botanists), *Acorus* (by W. A. Bromfield), and *Stratiotes* (by A. De Candolle) are decided not to be true natives, then the fact becomes simply that 20 genera, each representing an order, are absent from one or other of the three latitudinal divisions; all of them being so absent from North Britain, except *Eriocaulon*, which is found there only.

In thus passing from orders to genera, we find the same prevailing tendency to northerly decrease or cessation among the genera of larger orders also; many being quite absent from Middle, and more especially from North Britain. As in the case of orders, however, exceptions are found also among genera; and these exceptions are not restricted to small genera. Some few of the largest genera decrease in their number of species in a southerly direction; of which the troublesome genera *Salix* and *Hieracium* are examples. And among some other smaller genera, the appearance of alpine or arctic species on the northern mountains either augments the total number, or compensates for any cessation of more southern species. *Pyrola*, *Luzula*, *Juncus*, *Cerastium*, *Arenaria*, *Saxifraga*, *Gnaphalium*, *Pinguicula*, and *Erigeron* are generic examples of numerical increase northwards; and, conversely, of decrease southwards.

Certain smaller genera are confined to the flora of North Britain, though much too few in number to balance those which are peculiar to the more southerly divisions. *Cherleria*, *Mulgedium*, *Menziesia*, *Azalea*, *Goodyera*, *Eriocaulon*, *Hierochloe*, and *Pseudathyrium* are thus restricted; and all of them are genera of a solitary species each in this country, unless the *P. flexile* may prove to be a true natural species, and so add a second to the genus last named.

Some other genera are common to North and Mid Britain, though equally wanting in the South. Such are *Oxytropis*, *Sibbaldia*, *Ligusticum*, *Linnaea*, *Arbutus*, *Trientalis*, *Corallorhiza*, *Tofieldia*, *Elyna*, and *Sesleria*. Few years ago, *Dryas* might have been included in this short enumeration; but by its recent discovery in Staffordshire, and re-discovery in North Wales, it becomes a genus for all the divisions. *Actaea* and *Cypripedium* are deemed peculiar to Mid Britain; possibly *Asarum* also.

The absent genera in North Britain, that is, those restricted to one or both of the two more southerly divisions, are too numerous for citation. They can be ascertained readily from the 'summary of distribution,' if required. And the absent species can be ascertained at the same source for any of the divisions; or, more closely in accordance with their provincial and latitudinal limits, from the 'areas of species.' Numerical summaries relating to the cessation of species under each degree of latitude, and in each province from south to north, and north to south, have been before given, on page 321.

### 9. *Relation of Plants to Altitude.*

Differences of altitude or elevation are marked by floral changes somewhat less wide than those arising from differences of latitude; the alterations resulting from those two geographical conditions being analogous, though not altogether identical. In some respects the floral changes might appear to be much wider in connexion with height above the sea; being brought about very rapidly in proportion to the space of ground intervening between different levels. By a railway journey from London to Aberdeen, we may change our flora considerably in the course of a single day; but in order to effect that change,

we travel over several hundreds of miles horizontally. In another single day, by ascending Loch-na-gar or other of the lofty hills in Aberdeenshire, we may further change our flora, by the walk of a few miles in length, more than we did by the railway run of half as many hundreds. Starting from an elevated inland base, this rapid change is made by an ascent of about three thousand feet in vertical height; during which a change of climate is experienced, which is more than equivalent to the climatal difference between Middlesex and Aberdeenshire, at or near the coast-level.

As before alluded to, it is currently known that the changes traceable in the flora and general vegetation, while ascending mountains, much resemble those changes which would be observed on the plains or other low grounds, by travelling the necessary distance in a polar direction. Though rather close, the similarity is not by any means so close and uniform as it is represented to be by various botanical writers, whose ideas of science are confined to reading books at home, and then re-concocting their contents into other books. For instance, the upper limits of plants on mountains, those both of individual species and of groups, are not seldom found higher than might have been anticipated from their polar extension; and occasionally they are less high.

Further, the floral identity is often far less than it is usually represented to be by the retailers of book knowledge. The highest flora of intertropical countries, at levels bordering closely on the snow-line, is not at all identically with the arctic flora by its species, nor yet exclusively so by its genera, or even by its orders. So likewise, the upper mountain and alpine floras of North Africa and its adjacent islands include comparatively few boreal or arctic species. These countries have their own moun-



tain floras, bearing some considerable generic or ordinal resemblance to the floras of boreal and arctic lands, with little identity among the species. Even on the Alps and Pyrenees of Europe, as a traveller approximates towards their snowy summits and gelid glaciers, he finds there only a portion of the arctic or sub-polar flora; and that portion is intermingled among many other non-arctic species, whose affinities are those of the more southern latitudes where those mountains are situate.

A remark in the writings of Tournefort has been copied and re-copied a hundred times over by non-inquiring book-makers, and in dull routine continues to be misconstrued or misapplied up to the current year. The following passages are transcribed from a recent work of considerable merit, in exemplification of a false generality given to Tournefort's idea, which is only sound while more correctly applied and limited:—

“Again, as indeed must be perceptible to every one who has visited mountainous countries, vegetation alters in its characters at different elevations, and it has been shown that these variations correspond to those which are observed on the level plains in proceeding from the south towards the north; the increased severity of the climate of the higher localities acting exactly in the same way as the colder climate of the regions lying further from the equator.” . . . . . “In his Voyage to the Levant, Tournefort relates that he was struck with the alterations in the characters of the vegetation as he ascended Mount Ararat; at the foot he passed through the plants of Asia Minor; half-up he met with those of France, and at the summit he recognized the members of the Lapland flora. Linnæus carried out this idea somewhat further, and the observations of all subsequent travellers have only served to confirm and extend it. Step

by step as the land rises in any mountain region the vegetation assumes, more and more, a polar character; and in the mountains of the tropics, a succession of stages have been distinguished, corresponding in the general peculiarities of the plants which clothe them, to tracts extending horizontally, in succession, on the sea-level, from the base of these mountains to the frozen regions within the arctic and antarctic circles."

In these passages, and others which succeed them, there are just those few grains of truth among the chaffy falseness, which must forbid a denial *in toto*. Increased severity of climate on the mountains does not act on the flora "exactly in the same way" as the colder climate of regions farther from the equator. And it would assuredly puzzle the writer of those vaguely general passages, if he were called upon to enumerate the arctic and antarctic floras, species by species, or even genus by genus, repeated near the snow-line on tropical mountains,—or, conversely, to find the plants of the tropical mountains among those brought home by our arctic voyagers.

The correction here sought to be impressed, is, that in receding from polar towards equatorial latitudes, the alpine or mountain floras themselves really become less and less arctic; although it may be quite true that the change is less rapid and complete, than that observed between the floras of the plains, if severed as widely in latitude. In a southerly direction, polar and arctic species successively cease to be seen even upon the highest mountains; their places being more numerously supplied by other non-arctic species; and these latter frequently having a closer generic and ordinal alliance with the comparatively southern species of the low grounds. It is important to note this fact, in reference to certain hypothetical views of floral distribution lately promulgated. And it may

bear also upon Vestigian views, when these shall have been corrected and made scientific by help of Darwinian discernment.

Such an increasing departure from floral identity might reasonably be expected, in passing from polar coasts to intertropical mountains, on account of the increasing dissimilarity between the climates of high latitudes and of high altitudes. The slighter variations of temperature in low latitudes being found also on their mountains (although the mountain climate may not be quite so uniform as that of the plains and coast-line beneath them), the arctic-alpine flora of high latitudes gradually gives place in low latitudes to one less adapted to bear extreme cold ; while various species of this latter temperate-alpine or tropical-alpine flora still require no higher temperature for their season of growth, than is required by the arctic-alpines ; perhaps even demanding a relatively lower temperature. Partly on this account, it may be, that we see the mountain plants of more southern latitudes growing well in our un-heated garden frames during mild English winters, and some of them even freely flowering, if barely preserved from frost by night ; although the day temperature remains too low in such frames, to allow the simultaneous development of the alpine plants of Scotland and other more northern lands ; which consequently continue dormant there until the sunny warmth of spring raises the temperature for them by day. *Calceolarias* grow, and flower, and even seed, in a temperature which leaves *Saxifrages* torpid ; and yet the slight frosts of spring and autumn, which growing *Saxifrages* bear with impunity, are fatal to those same *Calceolarias*.

But our immediate concern is with this island and its own plants. The upper mountain flora of Britain still



corresponds rather closely with the lower flora of boreal and arctic lands; although it wants many of the arctic species. And moreover the floral diversity above mentioned, as induced by the intermingling of other species and genera, may be observed to some small extent on the hills of Britain; even on those of North Britain. The mountain plants of Scotland, which botanical collectors seek with so much eagerness under the designation of 'alpines,' are mostly identical with species descending to lower levels in more boreal lands. But several others of the boreal species fail to reach the hills of Britain, though found in Iceland or Faroe, and numerous in Scandinavia. And among those which do occur on the mountains of North Britain, some very few in turn fail to reach the more southerly masses of the Alps and Pyrenees; for example, *Arenaria rubella*, *Saxifraga rivularis*, *Alopecurus alpinus*, &c.

Moreover, among the arctic-alpines which are continued southwards to the hills of Britain, other species are also found which do not occur along with the proper arctics in the low grounds of corresponding northern latitudes. In example, *Cherleria sedoides* is a thoroughly alpine plant in Scotland; growing there only upon the mountains, and among the truly arctic plants; being absent from Scandinavia, Russia, Siberia, North America; but present on the Alps, Pyrenees, and other European mountains to the southward of Britain. *Helianthemum canum* and *Meconopsis cambrica* in England and Wales, and *Saxifraga umbrosa* with its allied species in Ireland, supply somewhat similar illustrations from the more southern and lower hills of the British islands.

Probably on account of the decreased height and bulk of the hills, as we pass southward in Britain, such illustrations are scanty in number; so that a change in the

mountain flora is chiefly made obvious there by the disappearance of many of the arctic species of the Scottish hills, and very little so by the appearance of others to replace them ; that is, except in so far as species of the plains ascend high enough to do so. *Sedum anglicum*, for example, found equally high on the hills of Wales, as several other plants which extend much farther northwards.

In Britain, comparatively few plants are absolutely restricted to levels situate much above the coast line, although many of them become more prevalent on the mountains. The opposite of this is not true ; many species being quite restricted to the low grounds ; and among the ascending species there is a large reduction of numbers for each thousand feet of vertical height. This reduction may be attributed chiefly to the increasing altitude, and consequent deterioration of climate ; but it is also partly attributable to the diminished space or surface. It is difficult to analyse the joint result, and apportion the share of influence between the two conditions. But the simple fact, that difference of area will considerably affect the numerical results attained by comparing the floras of different altitudes, has been already shown on page 351, by placing in contrast the numbers of species ascertained above certain descending levels in the North of England and in the Highlands of Scotland.

Subject to any necessary correction on account of differences in the extent of surface, the total floras of the three successive stages adopted in the 'summary of distribution' exhibit these wide numerical differences in the 'distributive census,' page 364 :—

Above 700 yards, ....	<i>present</i>	262 species.
Between 700 and 200 yards,		687
Below 200 yards, .....		1319

Or, making the comparison between the numbers of the absent species, instead of making it between the numbers of those present in each stage of altitude :—

Above 700 yards, .... *absent* 1163 species.

Between 700 and 200 yards, 738

Below 200 yards, ..... 106

It is repeated, these numbers are approximate only ; the vertical ranges of various species being yet imperfectly ascertained. Likely enough, as intimated on pages 230 and 231, several additional species will be found to occur rather above 200 yards ; particularly those on the undulating downs and hills in the south-easterly provinces of England, which occasionally exceed 200 yards, and some of them rising above 300 yards of vertical height. These portions of the open country, distant from the higher hills, have not been taken into account ; the altitudes for the plants having been almost exclusively ascertained in Middle and North Britain, with very few southern additions.

It is to be kept in recollection here, that difference of latitude will tend to lessen the floral diversities at different stages of elevation. Subject to some local exceptions from other conditions interfering, it is familiarly known to be a general rule or fact, that the lower limits of species descend, and that the upper limits of species usually become lowered, on mountains of equal bulk and elevation, as we trace plants in the polar direction to higher latitudes and colder climates. The latitudinal extent of Britain is amply sufficient to show this descent in vertical limits, especially a descent of the lower limits of many plants. Thus, at or very near the sea-level in North Britain we may see *Thalictrum alpinum*, *Carex capillaris*, *Dryas octopetala*, *Draba incana*, *Saxifraga oppositifolia*, and various other plants, which in Middle and South Britain occur only above the lowest stage of altitude.



So likewise in North Britain some plants occur in the ascending stage of altitude, between 200 and 700 yards, which in England and Wales are found only above 700 yards; for example, *Salix herbacea* and *Carex rigida*. The decrease of height for the lower limits, arising out of more northerly latitude, thus brings species into the same ascending stage, if our view takes in the entire length of Britain; while a more limited view would correctly assign them to different stages, and thus tend to augment the discrepancies between the floras of different levels.

In accordance with the decrease in the total flora, vertical ascent will tend usually to decrease also the orders and their included species. The number of orders represented in the three vertical stages is varied thus:—

Lowest, 98. Ascending, 77. Uppermost, 47.

*Saxifragaceæ* is the only order which exhibits an absolute increase of species in the uppermost stage; and the excess is one of a single species only over the numbers found in the two lower stages. *Coniferæ* rise to four species in the middle stage, compared with three in the others; this excess being explained by the occurrence of *Taxus baccata* above 200 yards, and of *Juniperus nana* below 700 yards; although these two conifers do not seem to grow actually on the same level. *Melanthiaceæ* are equal in the three stages; *Tofieldia* succeeding *Colchicum*. All the other orders (excepting some of those of a solitary species each) show a decrease in number of species in one or other of the higher stages; the decrease being slower or more rapid, greater or less, among the various orders, one compared with another, as exhibited in the tabular list of them on pages 362 to 364.

But as in the case of latitude, still more so in that of altitude, the absolute decrease of numbers in certain

orders is so slight as to leave them increased relatively to the much smaller total flora of the higher stage. This is exemplified in the 'distributive census of orders' above referred to, page 362, by the varying irregularity of the numbers in the same column of figures. In the column devoted to altitude, the first series of numbers is almost regular; that is, the orders which include the species found below 200 yards follow nearly the same series as the orders do for the whole of Britain. Here *Scrophulariaceæ* and *Lamiaceæ* simply change places; being 44 and 47 species, or nos. 10 and 9 of the series, instead of 9 and 10. *Filices* require to be placed two steps lower down in the series; sinking from no. 11 to no. 13. *Juncaceæ* go down from no. 16 to no. 18. The few inequalities left after these changes, would mostly depend on single species in small orders.

In the second series of the same column, under the letter A, the numbers run more irregularly; thus showing that the numerical value of the orders, relatively to each other, is so far changed in the second stage of altitude, between 200 and 700 yards. In the third series of the same column, under the letter U, the departure from regularity is yet greater; thus showing that the relative numerical value of the orders, or their predominance in species, differs much on the higher hills, when compared with their relative value near the coast-level.

Without repeating here the names of all the small orders, which have been already given in detailed enumeration in the distributive census list referred to, the subjoined re-arrangement will place in comparison the principal orders of the three successive stages of altitude. The names of the orders succeed each other in accordance with the number of their included species, shown for each of the three stages by the figures set after the names.

Below 200 yards.	200—700 yards.	Above 700 yards.
1. <i>Compositæ</i> , 111 sps.	<i>Compositæ</i> , 73.	<i>Compositæ</i> , 35.
2. <i>Gramina</i> , 104.	<i>Gramina</i> , 58.	<i>Cyperoides</i> , 29.
3. <i>Cyperoides</i> , 81.	<i>Cyperoides</i> , 43.	<i>Gramina</i> , 20.
4. <i>Rosaceæ</i> , 77.	<i>Rosaceæ</i> , 38.	<i>Filices</i> , 17.
5. <i>Leguminiferæ</i> , 67.	<i>Filices</i> , 30.	<i>Caryophyllaceæ</i> , 15.
6. <i>Cruciferæ</i> , 58.	<i>Caryophyllaceæ</i> , 26.	<i>Juncaceæ</i> , 13.
7. <i>Umbelliferæ</i> , 57.	<i>Cruciferæ</i> , 25.	<i>Ericaceæ</i> , 13.
8. <i>Caryophyllaceæ</i> , 48.	<i>Leguminiferæ</i> , 24.	<i>Rosaceæ</i> , 12.
9. <i>Lamiaceæ</i> , 47.	<i>Ranunculaceæ</i> , 21.	<i>Saxifragaceæ</i> , 11.
10. <i>Scrophulariaceæ</i> , 44.	<i>Scrophulariaceæ</i> , 21.	<i>Scrophulariaceæ</i> , 11.
11. <i>Orchidaceæ</i> , 39.	<i>Amentiferæ</i> , 20.	<i>Cruciferæ</i> , 9.
12. <i>Ranunculaceæ</i> , 35.	<i>Lamiaceæ</i> , 19.	<i>Ranunculaceæ</i> , 9.
13. <i>Filices</i> , 33.	<i>Umbelliferæ</i> , 18.	<i>Amentiferæ</i> , 8.
14. <i>Amentiferæ</i> , 26.	<i>Orchidaceæ</i> , 16.	<i>Leguminiferæ</i> , 6.
15. <i>Polygonaceæ</i> , 26.	<i>Polygonaceæ</i> , 15.	<i>Lycopodiaceæ</i> , 5.
16. <i>Chenopodiaceæ</i> , 24.	<i>Juncaceæ</i> , 15.	<i>Polygonaceæ</i> , 3.
17. <i>Potamaceæ</i> , 22.	<i>Ericaceæ</i> , 14.	<i>Orchidaceæ</i> , 3.
18. <i>Juncaceæ</i> , 20.	<i>Rubiaceæ</i> , 11.	<i>Violaceæ</i> , 3.
19. <i>Boraginaceæ</i> , 20.	<i>Boraginaceæ</i> , 11.	<i>Gentianaceæ</i> , 3.
20. <i>Liliaceæ</i> , 19.	<i>Saxifragaceæ</i> , 10.	<i>Coniferæ</i> , 3.
21. <i>Ericaceæ</i> , 17.	<i>Geraniaceæ</i> , 9.	<i>Rubiaceæ</i> , 2.
22. <i>Rubiaceæ</i> , 17.	<i>Onagraceæ</i> , 9.	<i>Onagraceæ</i> , 2.
23. <i>Primulaceæ</i> , 17.	<i>Liliaceæ</i> , 8.	<i>Primulaceæ</i> , 2.
24. <i>Geraniaceæ</i> , 14.	<i>Hypericaceæ</i> , 8.	<i>Lamiaceæ</i> , 2.
25. <i>Euphorbiaceæ</i> , 14.	<i>Crassulaceæ</i> , 8.	<i>Crassulaceæ</i> , 2.
26. <i>Campanulaceæ</i> , 14.	<i>Primulaceæ</i> , 7.	<i>Umbelliferæ</i> , 2.
27. <i>Gentianaceæ</i> , 12.	<i>Potamaceæ</i> , 6.	<i>Equisetaceæ</i> , 2.
28. <i>Onagraceæ</i> , 11.	<i>Violaceæ</i> , etc. 6.	<i>Melanthiaceæ</i> , 2.

Only two of the orders occupy the same position in all three stages; namely, *Compositæ* at the head of the series, and *Scrophulariaceæ* answering to no. 10 in each stage of altitude. In various instances the same order is got on the same line or prefixed no. for two of the stages of ascent, without interrupting the regularity of the figures in tracing downwards; and in some few instances, the place of the same order in the other stage differs only by



one step or no. Thus, *Gramina* and *Cyperoides* run in nos. 2 and 3, *Polygonaceæ* in 15 and 16. One of the widest differences among the 28 orders occurs in *Saxifragaceæ*; which rise from 29 (if the list had been carried down to that no.) in the lowest stage, to 20 in the middle stage, and to 9 in the uppermost stage. Some few of these orders, however, are quite absent from the uppermost stage, as *Chenopodiaceæ* and *Euphorbiaceæ*.

In the eighth chapter 'altitude of species' lists have been printed for the purpose of showing the upper limits of each species on the mountains of Scotland and North England. If the absolute or the comparative heights attained by individual species, should be required in more exact detail than the indications given in the 'summary of distribution' under the three successive stages of altitude, and under the six ascending or climatal zones, their heights may be ascertained by reference to those lists. And the vertical ranges of the plants, as affected by latitude and other conditions, will still receive some further incidental illustrations in the next section of these general remarks on distribution.

#### 10. *Relations of Plants with Climate.*

Incidental remarks, bearing upon the connexions between plants and climate, have been made in various places throughout this volume, and occasionally in the three preceding volumes. Indeed, it is scarcely possible to treat about any of the geographical relations of plants, without touching the all-pervading influence of climate upon distribution. And yet, as was truly remarked on page 145, "it is difficult even to present impossibility, to trace out very special connexions between plants and climate"; although, on the general view, the fact of very

intimate connexions seems obvious enough, whether we look to the earth at large or to Britain by itself.

Each botanist who has devoted much attention to this intricate subject, has his own particular predilections and fancies about the influence of temperature more especially, and the best mode of estimating that influence in its relations to plants. And each can readily pick out facts enough to give a good show of support to his own favorite fancies; the facts themselves being countless in their numbers and variations, and some of them of course suiting any theory which has a basis of truth, however partial and inexact it may be in the whole. Near one hundred thousand species, and perhaps almost millions of differences in local situations, and in the proportions between their temperature and humidity, and the dates and durations of either, are an ample stock of facts, among which to seek for evidences and illustrations of climatal hypotheses.

That existing differences between the climates of different countries are largely influential in determining the existing differences between their floras, is usually admitted as a truism; although quite understood not to be the only cause or condition of their floral diversities. Perhaps the most condensed and obvious illustration of climatal influence on plants, accessible in this country, may be found in the gardens of wealthy amateurs, and in those of the leading tradesmen who raise plants and produce for sale. Their stoves and hothouses exemplify the influence of continued high temperature, with varied degrees of humidity;—say, the warmest weeks of an English summer continued through the year. Their conservatories or greenhouses exemplify the influence of like climatal conditions in more temperate degrees, and with greater variations of season;—say, the summers of

England combined with the winters of warmer latitudes. Their unheated or "cold" frames also admit of further varied combinations between the temperatures of the seasons, with choice of sun or shade. Simply by aid of glass, and without fires, all or any of our natural seasons can be made warmer, and may be made either more equable or less equable, for the plants placed within such frames. Through shelter from frost, the winters are rendered considerably less cold for them; while shelter from sun, assisted by evaporation, can make also the summers cooler for plants thus treated, than it is to plants left in the open air. And besides creating so many variations of temperature, the gardener also largely controls the other chief element of climate, by modifying almost at will the humidity of earth and atmosphere, at any season, within his frames and glass-houses. Even in ordinary gardens the seasons are usually experienced under some favoring conditions of shelter, and with the injurious extremes of humidity prevented by drainage, and those of drought relieved by artificial waterings. Outside these gardens, again, there is the natural climate of Britain, with its many local variations.

All this is familiar enough. It is run over here in brief description, to impress the fact, that in this manner there is really brought under botanical observation, and condensed into small spaces of land, a vast amount of floral and vegetal diversity, directly connected with and dependant upon great diversities of climate. And the demonstrated fact, that such differences are found serviceable or necessary in the cultivation of plants and crops, shows that the climatal requirements of different species of plants are widely different, in a more clear and convincing manner than the same requirements and differences ever have been shown by the best treatises on



phyto-geography. In the general view, the various artificial climates of gardeners may be held to represent passably well the real climates of most countries that are warmer or milder than Britain. Adding thereto our own climate in its natural conditions, little is left unrepresented except the intensities of winter cold and of desiccating summer heats; neither of which does the gardener wish to imitate here.

Though wide climatal diversities are thus shown to be necessary for the co-existence of the various plants constituting the present flora of the globe, — another fact of an opposite character is not the less true; namely, that many plants are adapted to endure and thrive under very different climates. Species common to Britain and Siberia, to Britain and Africa, to Britain and Madeira, clearly must be adapted to grow under very dissimilar conditions of climate. But it is unnecessary to pass beyond the area of Britain itself, to find this fact illustrated by examples. A very few of which may suffice for illustration here.

*Festuca ovina* on a gravel bank in Cornwall, or on a chalk down in Kent, and the same species at four thousand feet of elevation on the mountains of Scotland, — are certainly placed under widely different conditions of climate. So likewise are *Calluna vulgaris* flourishing on the low heaths of Cornwall, and *Vaccinium Myrtillus* growing in woods which meet the sea-tides in Devon, — if compared with other examples of the same shrubs at three thousand feet of elevation on the hills of Aberdeenshire. The mean temperatures of the whole year, — the means of the several seasons, — those of the warmest and coldest months, — those of the day and night, — the maxima and minima of the year, season, month, day and night, — the sum of the daily temperatures, — all must differ much in those very dissimilar situations. And yet the same species will

there maintain itself century after century,—that is, endlessly to our present mental vision,—under those different conditions of temperature.

The like comparisons or contrasts might be made in respect of humidity also. *Polygonum amphibium* will grow well in ponds and canals, where its roots are under water the year through; also growing well under a changed form, in meadows and other places which are inundated only occasionally, and then chiefly during the season of its apparent torpidity; and being still able to exist also on cultivated land, the surface of which is never under water. *Chrysosplenium oppositifolium* grows vigorously in damp and shaded places on the coast-level in southern England; and it thrives also in cold springlets on the unsheltered acclivities of the Highland mountains; the temperature and humidity of the two situations being always widely dissimilar, unless perhaps occasionally in the winter, while the water is frozen and the plants buried under snow. *Montia fontana* occurs with the *Chrysosplenium* in these mountain springlets; being found also in the lowest water-courses of the southern provinces, and likewise as a weed in gardens there.

All species, it is true, are not adapted to endure such wide diversities of temperature or humidity; and many seem to have only a short range of climate. The *Menziesia polifolia* of Ireland, and the *Erica vagans* of Cornwall, are occasionally killed by the severity of the winter frosts near London, and would probably not endure summers much drier, than experienced there occasionally. The western *Pinguicula lusitanica* and *Sibthorpia europæa* are apparently unfitted to endure the wider variations of moisture and dryness to which they would be subjected in the eastern counties of England. The *Saxifrages* of Ireland will bear well enough the more severe climate of Cumberland

and western Yorkshire, probably because humid; while they shrivel and sometimes die under the brighter sun and drier atmosphere of Surrey. So likewise the hill plants of the Azore isles are kept with difficulty in the same county of England; where the winters are found to be too cold for them, and the summers too dry, and perhaps also too warm. Thousands of other such examples might be cited. It may probably be quite true, that every species is fitted to bear some diversities of climate; while many are adapted to bear very wide diversities.

Grave difficulties appear to beset all attempts to ascertain the range of temperature and other climatal conditions of species with any close approach to exactness. The climates in which they do not grow, and on experiment will not grow, might indeed be ascertained approximately for a goodly number. But the climate in which they are now seen to grow naturally, is too frequently an imperfect indication of the range or diversities of climate in which they could grow. We preserve numerous foreign plants in the borders of our gardens with little more care than the simple process of preventing their destruction by the native and imported weeds which outgrow and smother them. Without human aid most of those foreign species would soon cease to grow there, prevented by other circumstances than climate, or operating conjointly with climate. Yet who can venture to assert that no combination of natural circumstances ever did or ever will occur, sufficient to enable those same species to acquire hereditary hold of the ground here, for an indefinite time, without human assistance?

In what manner, then, are we to ascertain and express the relations between plants and climate, more especially the temperature necessary for their development? These must still be inferred almost entirely from the existing



conditions of species-distribution ; although it is to be feared that such inferences will be imperfect and unprecise. Mean annual temperature was looked to almost exclusively at one time, as affording the most satisfactory explanation of floral distribution. Plenty of facts were adduced to support this mode of accounting climatically for the similarities and diversities of floral distribution ; closely followed by plenty of exceptional facts also. Then, the climate of the different seasons was resorted to, especially the contrasts of summer and winter temperatures, under the idea of qualifying the indications of mean yearly temperature, gradually ascertained to be too vaguely general, and subject to too many exceptional contradictions. The extremes of temperature and other circumstances have also been taken into account, and have occasionally seemed to account for peculiarities of distribution. Altogether, much interesting and explanatory information on the subject has been gradually accumulated ; though unfortunately it is still too vague and incomplete for plenary satisfaction or practical usefulness.

Among the latest fancies, is that of adding together the daily temperatures into a gross amount or sum-total of temperature, to which plants are supposed to be subjected during the period of their growth. This is in effect the temperature of the year, leaving out those portions of the year during which the temperature is believed to be too low to have any vivifying or developing influence on the species under consideration. It cannot be denied that there is a substantial basis of truth for this improvement on the older estimates of mean temperature. But it will be found vastly more difficult in application ; and it opens the way to a "cooking of accounts" almost at will. Wherever results or sums-total do not accord with preconceived expectation, they may be corrected and brought

equal by the simple process of taking in or striking out a few more of the thermometrical degrees. For most species it will be found too uncertain—that is, too optional—at what precise degree of the thermometer the plant commences, continues, or ceases to develope. Roots, leaves, flowers, fruits, all require different degrees of temperature for their development, and applied unequally at different stages of their growth.

It is difficult to suggest any practicable mode of observing and recording instrumental indications of temperature, which would be adapted to the varying requirements of plants, regarded in this manner. In the same country, at the very same time, various species may be in all the different stages of growth, from germination to maturation, from absolute torpidity to vigorous development. While the snowdrop is flowering in our gardens, the buds of the oak are dormant. And while the oak-flower is slowly developing into the perfect acorn, the snowdrop becomes torpid; resuming its growth about the date when the acorn falls; and doing so earlier if the ground becomes damp, later if it continues dry, almost irrespective of temperature at a season when uniformity prevails. The colchicum and the daffodil are at rest for a very short period of the summer's warmth and dryness. During nearly the same period the leaves of the white hellebore are still growing; its flower-buds appearing later in the autumn, and expanding into blossom in the midst of winter; whence its familiar name of the 'Christmas Rose.' And among the species which follow a more usual course of development, by commencing to grow in spring and ceasing in autumn, the dates of commencement and cessation, and consequently also the degrees of useful temperature, can scarcely be specified.

True it is, however, that the gardener who raises early potatoes by help of warm litter and night coverings,—who brings forward his lettuce and celery on a gentle hotbed, with the purpose of getting this produce earlier into market than it would otherwise come in,—who forces his cucumbers and melons by the application of higher heat,—or who gets his grapes and peaches ripened under glass earlier or better than they could be ripened in our open climate,—in these, and other such proceedings, works under a practical conviction that greater heat during a shorter time will produce results very similar to those brought about by less heat continued through a longer time, or applied less continuously. The fact is clear and certain enough within gardening limits; and it no doubt must hold true to some considerable extent in reference to the natural growth of plants. A shorter and warmer summer may thus be equalised with a longer and cooler summer, in its effects on the growth of some species; and in this manner may be determined the possibility of their existence in two countries of climates very dissimilar.

But there must certainly be an early limit to this tendency of time and temperature to balance each other, or compensate one for the other. The idea is too easily pushed to a *reductio ad absurdum*, to allow of that wide extension and felicitously precise application to phyto-geography, which M. De Candolle apparently expects from it. The sum of the daily temperatures experienced by a plant might be the same with very different results, destructive in the first,—unuseful in the second,—successful in the third,—injurious in the fourth,—destructive again in the fifth, &c. For instance,



200 days at or averaging 30 fahr. make 6000.

150                   "                   40                   "                   6000.

100                   "                   60                   "                   6000.

50                   "                   120                   "                   6000.

25                   "                   240                   "                   6000.

This sort of reduction into absurdity, however, is avoided by a limitation of the temperatures to those useful or necessary for the species, omitting extremes. All the temperatures below those which promote the due development of the species, and all those which are needlessly or injuriously too high, are to be left out of the reckoning. The necessity of these omissions renders the problem too intricate for practical solution and service. The sum of the useful temperatures will be found scarcely reckonable for any species. And no ordinary thermometrical records are fairly available, on account of the variable rates and degrees required by the different species of the same flora or country, and differently required by the same species at their different stages of growth. It is highly probable also, that different temperatures are requisite in some degree of relation to differences of humidity; and thus further increasing the difficulties of the subject. It would seem hardly less difficult to ascertain the gross amount of atmospheric motion, which is required by any given species of plant, or is endurable by it without deterioration or destruction.

The established routine of mean annual temperature has been adhered to in this work, not because this is believed to be the truest or closest indication of the climate required by a species, but because it is the only indication practically available at present. The degree of mean temperature, at which a species ceases to occur native in this country, is certainly no measure of that at

which it may be expected to cease in another country with dissimilar climate. But subject to those local differences in the seasons and extremes, before commented on at pages 166 to 174, mean annual temperature is not the less available on that account for various comparisons within Britain itself, and also for some comparisons between this island and the opposite coasts of the continent. The relative limits of different species within this island and on the adjacent European coasts, will admit of comparison through their ranges of mean yearly temperature, although these may not exactly express the special climates for each species. We may know that a man of 42 years is older than a man of 41 years of age, although we may be able to ascertain exactly neither the months nor the days when they respectively complete a year of added age.

Annual means subserve also passably well for comparisons between the altitudinal ranges of the same species for different divisions of the island, and even for testing the correspondence between altitudinal and latitudinal limits, as exemplified on pages 164, 165. Thus, when we find *Urtica dioica* traced up the Grampian mountains of North Britain to a height where the mean temperature is supposed to be about 4.05 centigrade (page 329), we may reasonably enough infer that the height represented by 6.00 in North England (page 336) is far below that at which the same species might exist, if suitable soil and site were there found for it higher up. So, again, on assuming the mean temperature of Orkney and Shetland to be equal with that experienced between 300 and 400 yards of altitude in North England, we should infer that many of the species which grow on the coast-level in those northern islets will also grow at or above 300 yards in England; and the fact is so.

Fully admitting the imperfections of such a climatal arrangement, it is still conceived that some interest would attach to an arrangement of the whole flora into a double linear series, according with the presumed mean annual temperatures under which the species have their respective limits, upper and lower, colder and warmer. The data for such an arrangement all exist in the preceding pages ; but the necessity of economizing space prevented further repetitions of the long list of names. Such an arrangement for upper limits might be founded upon that for the plants of the Grampian mountains, by interposing the few colder temperatures stated elsewhere, and then adding to the list those other species which apparently cease under higher temperatures, whether by latitude, or by altitude in the list for North England. The short thermal list of lower limits, on pages 352 to 356, might in turn be carried out by uniting therewith the latitudinal temperatures of species reaching further southward at slight elevations.

No ordinal summaries were made in accordance with the temperatures ; because these were mainly inferences either from latitude or from altitude. The summaries or census of orders were founded on those two geographical conditions instead ; first, taken separately and independently, by the latitudinal divisions and the stages of elevation ; and then, connectedly, by the ascending or climatal zones, in which the two former conditions were supposed to compensate or balance each other. These zones again fall under remark in the next section.

### 11. *Climatal Zones of Plants.*

The arrangement of plants into climatal (a more English-like termination than "climatic") zones was explained



at some length in the introductory portion of volume first, pages 19 to 43. Under such an arrangement the plants are placed in series, and divided into successive groups, in accordance with their geographical position relatively to each other. Such relative position appears to be determined by the climates to which they are respectively best adapted, and by the geographical peculiarities of the countries in which they are found. But the actual conditions, climatal and geographical, are combined in proportions so countlessly varied that they cannot be exactly ascertained for any single species separately, and still less can they be determined precisely for groups.

The influence of latitude and longitude, elevation, insularity, montane proximity, and other conditions, has been alluded to more or less fully on former pages; as also the partial extent to which altitude and latitude actually compensate for each other, in their influence on the floras of different countries. Climatal zones are designed to express the complex result from those conditions in their ever-varying proportions. But such zones are more conveniently, because more simply, traced out by reference to the relative limits and positions of the plants themselves, with only subordinate reference to their more special connexions with climate and geography.

In attempting to make out such a zonal arrangement for the flora of a whole country, which includes a considerable range of latitude and much inequality of surface, we proceed on the assumption that latitude and altitude do in the main compensate one for the other,—that on attaining a higher level in a more southerly district, we should mostly find there the same species that we should also find by a journey of sufficient latitudinal distance northwards,—that the higher the elevation of the more

southern hills, the more boreal would become their flora at the upper stages of height. But it has been insisted that this general notion requires limitation; that it becomes less strictly true and applicable, as the latitudinal distance increases; the floras of the higher montane zones becoming less identical with the floras of far boreal latitudes, as the distance between them increases.

Within the area of this island, however, it is found sufficiently possible to trace out certain zones of plants under the joint influence of latitude and elevation, modified somewhat by other conditions. The plants absent from the open country of South England, and which first appear about or above the bases of the hills of Wales and North England, are again met with on the northern coasts of Scotland, or inland in the lowest mountain valleys there. Those which occur higher up on the hills of South and Mid Britain, are again found on the mountains of North Britain; usually commencing there at lower levels than they descended to in England or Wales. And the upper zones of the plants on the Highland mountains, though unrepresented on the coast-level in this island, have a considerable floral identity with more boreal and arctic lands. As a general example, the flora of the mid-arctic zone in Britain may be said to occur on the coast-level in Iceland and other sub-arctic lands; and that of the superarctic zone is partially repeated at the coast-level in Spitzbergen and other sub-polar lands.

The floral identity is far from complete; considerable diversity of species being also found between any levels and latitudes so compared. Nor do the same species cease in the same relative order or sequence in successive stages of boreal latitude, as they do in successive stages of height on the mountain acclivities. If we should observe species *a b c d e f* ceasing in succession at

100 200 300 400 500 600 yards on a mountain in latitude 58, — and should then find *a* and *f* ceasing respectively in 60 and 70 of boreal latitude, it would still be by no means certain that *b c d e* would be found to cease at the corresponding intermediate latitudes of 62 64 66 68. Something similar might be expected, and would frequently be found; but the same succession would not occur either equally or constantly.

It will be recollected that two primary divisions were adopted in the first volume, pages 32 and 33, for the basis of a climatal arrangement in this country. — 1. The agrarian region included the whole coast-level and low grounds, up to the limit of cultivation; rising some hundreds of feet higher in South Britain than in North Britain. — 2. The arctic region included the acclivities and summits of the mountains above the limit of cultivation; commencing some hundreds of feet higher in the South than in the North, and at a very slight altitude in the extreme North, as in Shetland. These two regions were subdivided each into three subordinate zones (vol. 1, page 40) thus:—

- |                       |                         |
|-----------------------|-------------------------|
| 6. Super-arctic zone. | 3. Super-agrarian zone. |
| 5. Mid-arctic „       | 2. Mid-agrarian „       |
| 4. Infer-arctic „     | 1. Infer-agrarian „     |

The three agrarian zones are chiefly latitudinal, while the three arctic zones are exclusively altitudinal in this country. On passing to more northern lands the latter become latitudinal; while in passing southward from Scotland into England the upper agrarian zone is found above the middle one; and on reaching Wales, both middle and upper have place above the lower; so that the three agrarian zones also become altitudinal there. The descending levels of the zones, as traced from south to north, are indicated by the oblique lines which separate



1. *Orders predominant in the Agrarian zones.*

1 Inferagrarian.	2 Midagrarian.	3 Superagrarian.
1. Compositæ, 102.	Compositæ, 87.	Compositæ, 70.
2. Gramina, 102.	Gramina, 83.	Gramina, 64.
3. Cyperoides, 77.	Cyperoides, 68.	Cyperoides, 62.
4. Rosaceæ, 72.	Rosaceæ, 63.	Rosaceæ, 36.
5. Leguminiferæ, 65.	Leguminiferæ, 46.	Caryophyllaceæ, 33.
6. Cruciferæ, 54.	Cruciferæ, 45.	Leguminiferæ, 32.
7. Umbelliferæ, 54.	Umbelliferæ, 43.	Cruciferæ, 32.
8. Caryophyllaceæ, 45.	Caryophyllaceæ, 41.	Filices, 30.
9. Lamiaceæ, 45.	Lamiaceæ, 41.	Lamiaceæ, 25.
10. Scrophulariaceæ, 43.	Scrophulariaceæ, 36.	Umbelliferæ, 23.
11. Orchidaceæ, 35.	Filices, 33.	Scrophulariaceæ, 20.
12. Ranunculaceæ, 30.	Ranunculaceæ, 29.	Ranunculaceæ, 19.
13. Filices, 29.	Orchidaceæ, 27.	Amentiferæ, 18.
14. Chenopodiaceæ, 24.	Amentiferæ, 25.	Orchidaceæ, 17.
15. Polygonaceæ, 23.	Polygonaceæ, 21.	Polygonaceæ, 17.
16. Amentiferæ, 22.	Chenopodiaceæ, 20.	Juncaceæ, 16.
17. Potamaceæ, 21.	Potamaceæ, 20.	Ericaceæ, 16.
18. Boraginaceæ, 19.	Juncaceæ, 18.	Potamaceæ, 14.
19. Juncaceæ, 18.	Boraginaceæ, 17.	Boraginaceæ, 12.
20. Liliaceæ, 18.	Rubiaceæ, 15.	Rubiaceæ, 11.
21. Rubiaceæ, 16.	Primulaceæ, 14.	Primulaceæ, 11.
22. Geraniaceæ, 14.	Liliaceæ, 12.	Chenopodiaceæ, 10.
23. Euphorbiaceæ, 14.	Geraniaceæ, 12.	Saxifragaceæ, 10.
24. Campanulaceæ, 14.	Ericaceæ, 11.	Geraniaceæ, 9.
25. Primulaceæ, 13.	Gentianaceæ, 10.	Onagraceæ, 8.
26. Ericaceæ, 12.	Campanulaceæ, 10.	Hypericum, 8.
27. Gentianaceæ, 10.	Onagraceæ, 9.	Equisetum, 8.
28. Onagraceæ, 10.	Hypericum, 9.	Liliaceæ, 6.
29. Hypericum, 10.	Euphorbiaceæ, 8.	Gentianaceæ, 6.

them in the little diagram, placed at the left-hand lower corner of the lithographic map prefixed to volume third.

The 'climatal census of orders,' on pages 365 to 367 was an arrangement of the floras of the several regions and zones into their constituent orders, intended to show the number of species ascertained in each order for each

2. *Orders predominant in the Arctic zones.*

4 Inferarctic.	5 Midarctic.	6 Superarctic.
1. Compositæ, 33.	Compositæ, 32.	Compositæ, 14.
2. Cyperoides, 25.	Cyperoides, 28.	Gramina, 11.
3. Gramina, 21.	Gramina, 18.	Caryophyllaceæ, 11.
4. Filices, 20.	Caryophyllaceæ, 15.	Saxifragaceæ, 9.
5. Rosaceæ, 18.	Filices, 15.	Cyperoides, 8.
6. Caryophyllaceæ, 14.	Rosaceæ, 12.	Filices, 7.
7. Scrophulariaceæ, 12.	Amentiferæ, 11.	Juncaceæ, 7.
8. Ericaceæ, 12.	Ericaceæ, 11.	Rosaceæ, 5.
9. Leguminiferæ, 10.	Scrophulariaceæ, 10.	Cruciferæ, 5.
10. Ranunculaceæ, 10.	Juncaceæ, 10.	Ericaceæ, 5.
11. Amentiferæ, 10.	Cruciferæ, 9.	Scrophulariaceæ, 4.
12. Cruciferæ, 9.	Saxifragaceæ, 8.	Ranunculaceæ, 3.
13. Juncaceæ, 9.	Ranunculaceæ, 7 ?	Polygonaceæ, 3.
14. Saxifragaceæ, 7.	Leguminiferæ, 7.	Lycopodium, 3.
15. Onagraceæ, 6.	Polygonaceæ, 4.	Amentiferæ, 2.
16. Orchidaceæ, 5.	Lycopodium, 4.	Lamiaceæ, 1.
17. Lycopodium, 5.	Orchidaceæ, 3.	Boraginaceæ, 1.
18. Lamiaceæ, 4.	Onagraceæ, 3.	Rubiaceæ, 1.
19. Polygonaceæ, 4.	Viola, 3.	Gentianaceæ, 1.
20. Rubiaceæ, 4.	Umbelliferæ, 2.	Campanulaceæ, 1.
21. Gentianaceæ, 4.	Rubiaceæ, 2.	Onagraceæ, 1.
22. Umbelliferæ, 3.	Primulaceæ, 2.	Crassulaceæ, 1.
23. Primulaceæ, 3.	Gentianaceæ, 2.	Viola, 1.
24. Crassulaceæ, 3.	Crassulaceæ, 2.	Plumbaginaceæ, 1.
25. Viola, 3.	Equisetum, 2.	Melanthiaceæ, 1.
26. Equisetum, 3.	Coniferæ, 2.	Araliaceæ, 1.
27. Coniferæ, 3.	Melanthiaceæ, 2.	Oxalis, 1.
28. Geraniaceæ, 2.	Lamiaceæ, 1 ;—also,	Montia, 1.
29. Campanulaceæ, 2.	16 other orders.	Empetrum, 1.

region and each zone. By looking at the columns of figures in that census, any order may be traced across the six zones, and its more or less rapid decrease may be discerned at a glance,—occasionally, its relative increase, or even its absolute increase upwards in *Saxifragaceæ* and *Lycopodium*. But the numerical value (and consequent

relative position or predominance) of the various orders differs so widely in the different zones, that it has appeared worth while to reprint the principal orders, under a re-arrangement similar to that before given for the stages of altitude ; so as to bring the dominant orders of each zone uppermost in its own proper column. The lists on pages 486 and 487, are restricted to 29 orders ; that being the number of them hitherto ascertained to be represented in the superarctic zone. If such a re-arrangement of all the orders should be required for any purpose, those who use this work will easily make it by aid of the figures previously printed in the 'climatal census' referred to, pages 365 to 367. The rule or principle is very simple, as here adopted. The number of its species, ascertained in the zone, determines the position of the order in each column. And if two or more orders include equal numbers of species, their names are continued in that series or succession which will accord the nearest with their succession in the collective census list for total Britain.

The nos. prefixed to the names in the first column on each page are to be regarded as a key to the reading of the lists comparatively with each other. In tracing across the pages from left to right, from inferagrarian to super-arctic zone, some of the orders rise to higher nos. or positions ; others descend to lower ; others oscillating up and down. The rise to higher positions may be held to indicate a tendency of the order to prevail in the colder climates ; the fall to lower positions in turn indicating an opposite tendency. In example, there is a gradual rise in the nos. for the order

*Juncaceæ*, 19. 18 16 13 10 7.

So that, from being the nineteenth order in the inferagrarian zone, it becomes the seventh order in the super-arctic zone. Another example of nearly similar kind



may be found in

*Filices*, 13 11 8 4 5 6.

But the rise here appears less regular, and becomes slightly reversed again in the arctic zones. We should require to go down below no. 29 in the first column, to find the starting place for

*Saxifragaceæ*, 36 30 23 14 12 4.

This rise from the thirty-sixth to the fourth order shows the decided tendency of saxifrages to prevail in the colder climates. A rise in the like direction is much slighter in

*Caryophyllaceæ*, 8 8 5 6 4 3.

Turning attention next to some of the orders characterized by an opposite tendency, an example may be cited in

*Orchidaceæ*, 11 13 14 16 17 0.

These showy monocotyledons may be contrasted against the rushes; though the changes in the reversed direction are more gradual. No orchid has been ascertained certainly above the midarctic zone. The same holds true of

*Liliaceæ*, 20 22 28 35 0 0,

which are absent also in the midarctic zone. But this is partly a question of classification; for the order would be represented in both of the uppermost zones, according to those systematists who place *Narthecium* among the lilies. Among dicotyledonous orders we may cite

*Leguminiferæ*, 5 5 6 9 14 0,

as an example of decreasing numbers, and lower position relatively to other orders, in the colder zones. And a stronger example of the same tendency occurs in

*Umbelliferæ*, 7 7 10 22 20 0.

An irregularity occurs in the midarctic zone for that order, which may be again seen in the superarctic zone for

*Lamiaceæ*, 9 9 9 18 28 16.

These nos. appear to indicate a rise again of this order in the uppermost zone. But in the two uppermost zones it is represented only by a single species, *Thymus Serpyllum* or *Chamædrys*; and as the orders are much fewer in the superarctic zone, those of single species will unavoidably be placed higher there than are orders of single species in zones with a longer list; as is the case with the mid-arctic, which contains an excess of fifteen orders over the superarctic.

*Compositæ* keep the first place through all the six zones. But they are equalled by the *Gramina* in the lowest. And perhaps they maintain the first position in the arctic region only through an over-estimate of the species of *Hieracium*. Such, at any rate, would be the view in accordance with Bentham's Handbook; in which the alpine segregate species are re-combined into a single aggregate species, *H. alpinum*. Regarding the orders collectively, they are apportioned among the six zones thus:—

Inferagrarian,	95	present,	3	absent.
Midagrarian,	94	„	4	„
Superagrarian,	78	„	20	„
Inferarctic,	55	„	43	„
Midarctic,	44	„	54	„
Superarctic,	29	„	69	„

Among the 55 orders of the inferarctic zone, it seems as yet that 23 are represented there by only single species each. These are to be balanced against 17 so represented in the midarctic, and 14 in the superarctic. In the agrarian zones, we find the corresponding number of orders of one species each to be, 19 in the inferagrarian, 21 in the midagrarian, 20 in the superagrarian. So that, taking into account the more numerous orders of the agrarian zones, the representation by single species only is much in excess in the arctic zones. And thus again, as

in instances formerly cited, the smaller floras (or areas) are found in connexion with proportionately greater differences among the species; that is, the orders are relatively more numerous. The differences may be shown thus:—

Inferagrarian,	1225 species,	95 orders,	12.9 average.
Midagrarian,	1070 „	94 „	11.13 „
Superagrarian,	760 „	78 „	9.74 „
Inferarctic,	293 „	55 „	5.32 „
Midarctic,	244 „	44 „	5.54 „
Superarctic,	111 „	29 „	3.82 „

So that, with one trifling difference in a decimal figure, the average number of species to an order decreases with the decreasing floras. But it may be quite correct also to attribute some share in this result to the differences of climate; for the many closely similar species, so often observed in the floras of temperate climates, seem to condense (so to express it) into fewer species in colder climates.

Widely different as the floras of the zones must undoubtedly be, where the ordinal changes are so great, it is far from easy to describe or characterize them in such manner that a botanist may be enabled at once to see, by observing the plants around him, where and when he has passed from one zone to another, either in travelling horizontally or in ascending a mountain. Such divisions are natural, however, in the sense of being accordant with actual differences in the flora and vegetation,—how then are such divisions to be distinguished among themselves?

The most obvious characteristics of any zone are the species which there predominate in numbers or conspicuousness. But unfortunately those floral features are seldom or never available as precise tests. The predominating species in and through any one zone are



usually found also extending into the next succeeding zone; though maybe less abundantly there, in accordance with the general rule that distribution fines out gradually, and cannot be traced to abrupt limits.

On the other hand, in relying upon the presence of certain species, not passing into the next zone, we are resorting to a less obvious characteristic, by taking the partial or even local species, those which are becoming less general, instead of the predominating. But this latter test,—that of the presence of certain species, conjointly with the absence of other species,—is the only available method for defining the zones of plants relatively to each other. Those adopted in this work were accordingly characterized briefly in volume first, page 40, by the presence and absence of a few shrubs, as here repeated :—

6. Super-arctic zone—*Salix herbacea*, without *Calluna*.
5. Mid-arctic zone—*Calluna vulgaris*, without *Erica*.
4. Infer-arctic zone—*Erica Tetralix*, without *Pteris*.
3. Super-agrarian zone—*Pteris aquilina*, without *Rhamnus*.
2. Mid-agrarian zone—*Rhamnus catharticus*, without *Clematis*.
1. Infer-agrarian zone—*Clematis*, *Rubia*, *Cyperus longus*.

And the other plants were then assigned to the zones according to their positions relatively to the limits of those mentioned as characteristic; in the higher region, those ascending above the upper limit of the *Calluna* being referred to the superarctic zone,—those ascending above the *Erica*, but not passing the *Calluna*, being referred to the midarctic zone,—those ascending above the *Pteris* (or, more properly, above the cultivation of cereals), but not passing the *Erica*, being referred to the inferarctic zone. The cessation of cereal cultivation was made the chief test of distinction between the agrarian and arctic regions. And it was explained that the three zones of the former region were scarcely distinguishable

by the limits of any single species ; but that they were to be known partly by the presence or absence of several species, partly by geographical boundaries. In truth, the upper limits of all the plants mentioned are subject to local variations both in regard to elevation and in relation to the limits of other plants ; so that it is quite doubtful in some instances, whether certain species ought to be considered as ceasing in one zone, or as passing slightly into the zone next above. For instance, in the three lists of upper limits, adduced in volume first, pages 23 to 27, the following sequences of names occur amongst others :—

Anthoxanthum.	Calluna.	Anthoxanthum.
Calluna.	Anthoxanthum.	Tormentilla.
Tormentilla.	Tormentilla.	Calluna.

With only these three sequences of names to guide our decision, it would be impossible to feel much confidence in the assignment of the *Anthoxanthum* and *Tormentilla* to the superarctic zone, that above the *Calluna*, as made in the summary of distribution. On the contrary, it would so far appear more proper to place the limit of the *Calluna* between the limits of the other two plants, thus :—

Anthoxan., 1 2 1. Calluna, 2 1 3. Torment., 3 3 2.

But the zonal position of these species in the ‘summary of distribution’ has been determined on far more extended observation than shown by the three lists only. The *Anthoxanthum* has been so frequently seen much above the *Calluna*, as to leave little or no uncertainty in respect to its natural upper limit being above that of the heath. The tormentil is less certain, the alternations of upper limit between it and the heath being more equal, and the distance between them being usually less. But the former having been observed decidedly above the

heath on some few hills, where the limits of the heath itself did not appear unduly depressed, the latter has been deemed to have naturally a somewhat lower limit than the tormentil.

Similar considerations have induced the assignment of *Nardus stricta* to the superarctic zone; although the name of this grass is placed underneath that of *Calluna vulgaris* in the list of upper limits on page 325, where they stand thus :—

*Calluna vulgaris*, 1100 1080 1060 yards.

*Nardus stricta*, 1100 1070 1060 yards.

These altitudes were noted on the Ben-na-bourd range of hills in Aberdeenshire. On various other hills, in the same and other counties, where both *Nardus* and *Calluna* fail to attain 1060 yards, the grass was observed higher than the heath; and it was accordingly assigned to the zone above that which was made to correspond with the upper limit of the *Calluna*.

In both the examples thus cited by way of explanation, and in other similar instances, a further circumstance has been taken into account towards a decision in doubtful cases. The *Calluna* is very conspicuous on the mountain acclivities; and having been adopted as a test or character of the midarctic zone, its highest places were carefully looked for, and probably very seldom overlooked in any line of descent. On the contrary, a grass or other small herb is much more likely to be overlooked, especially if in leaf only. And moreover the *Nardus*, *Anthoxanthum*, and *Tormentilla* were not particularly looked for, though doubtless noted as soon as observed, while descending from the summits of high hills. On such account there seems to have been much greater chance for the names of any of these three herbaceous plants being occasionally entered too low in manuscript lists, than there was for



that of the *Calluna* to be entered too low. The same remark will also apply to the *Erica* and *Pteris*, comparatively with other less conspicuous plants that usually cease at similar altitudes or rather higher.

Partly on account of the circumstances here mentioned, it will be found that some discrepancies exist between the assignment of the species to their zones in the 'summary of distribution' and their relative positions in the lists of 'upper limits.' Those lists are local; and they show the local extremes, not the usual or average limits; still less the relative positions, as determined after allowing for sources of uncertainty and error. The positions of the three names—*Calluna*, *Erica*, *Pteris*—in the lists of upper limits on the Grampian mountains and in North England, will not divide those lists correctly into zones, always corresponding with the nos. given for the same species in the summary of distribution. In the list for the North of England especially, where the hills are insufficiently high, and the extent of much-elevated surface is very restricted, the true uppermost zones of the plants are shown quite imperfectly.

The list of upper limits on the Grampian mountains will be found to correspond much better with the zonal assignments. But there is an inexactness in this list also which demands some further exposition. The tract of the Grampians includes a large area, extending over about one degree of latitude, and stretching almost across Scotland longitudinally on both sides of the line of 57 north latitude. The climate cannot be equal over this wide tract. Its northern declivities, in the North-east Highlands, are doubtless colder than its southern declivities in the South-east Highlands. And the limits of the same species appear more depressed near the western coast, on and about Ben Nevis, than they are

observed to be in Aberdeenshire, on the eastern side of the island. But in the list here referred to the degrees of temperature are indicated in accordance with absolute height; and consequently the names of the species are placed in sequence without allowance for differences of site and situation, either by abatement or by increase. This can hardly fail to introduce some inaccuracies into the series, although they may not be very great. For instance, if the highest limit of one species in Aberdeenshire becomes contrasted against the highest limit of another species on or near Ben Nevis,—or the upper limit of one species on a southern declivity, in Perthshire, is contrasted against the upper limit of another species on a northern declivity, in Easternness.

Those sources of misposition are avoided by the assignments of plants to the zones being made according to their own relative limits, not according to absolute altitudes. But in turn this method may also occasionally mislead in a different manner; because the highest observed locality for a species, on any certain hill, may or may not be the highest at which it does or could grow on that hill. Nothing but the discrimination of experience, gradually acquired from oft-repeated observation, can correctly make the necessary allowances for these and various other uncertainties and chances of error.

It may thus be considered that some discrepancies are certain to occur between any two series of names, in which the plants are arranged on different rules, whether according to absolute altitude,—or according to supposed temperature, by the scale in which latitude and elevation are both taken into account,—or according to their own relative limits, irrespective of absolute height, &c. The fact to be impressed by these remarks, is, that such discrepancies and uncertainties will unavoidably interfere

with strict accuracy in any zonal or climatal arrangements of a flora; although with due care, and an ample supply of data, the interference may usually be kept within a narrow compass. Subject to these explanations, the subjoined double series of names may suffice to characterize the half-dozen zones passably well by the plants which occur in them:—

<i>Upper limits.</i>	<i>Lower limits.</i>
6.	6.
Salix herbacea.	Luzula arcuata.
Silene acaulis.	Saxifraga cernua.
Gnaphalium supinum.	rivularis.
Vaccinium Myrtillus.	cæspitosa.
Empetrum. Azalea.	Stellaria cerastoides.
Vaccinium uliginosum.	Draba rupestris.
5.	5.
Calluna. Trollius.	Cherleria. Azalea.
Eriophorum vaginatum.	Myosotis alpestris.
Pinguicula vulgaris.	Alopecurus alpinus.
Arbutus Urva-ursi.	Veronica alpina, saxatilis.
Geum rivale.	Juncus trifidus, castaneus.
Scabiosa succisa.	Salix herbacea.
4.	4.
Erica cinerea, Tetralix.	Sibbaldia. Pseudathyrium?
Prunella. Pinus?	Gnaphalium supinum.
Genista anglica.	Epilobium alpinum.
Salix aurita, repens.	Luzula spicata.
Rubus idæus. Myrica.	Juniperus nana.
Spartium. Digitalis.	Saussurea. Lloydia.
3.	3.
Pteris (rarely higher).	Arbutus. Oxyria.
Populus tremula.	Saxifraga stellaris.
Alnus. Corylus.	Thalictrum alpinum.
Quercus. Lonicera.	Alchemilla alpina.
Cratægus. Ilex.	Epilobium alsinifolium.
Hedera. Fraxinus.	Allosorus. Tofieldia.



<i>Upper limits.</i>	<i>Lower limits.</i>
2.	2.
Convolvulus sepium.	Vaccinium Vitis-idæa.
Euonymus. Bidens.	Empetrum. Linnaea.
Rhamnus. Tamus.	Rhodiola. Ligusticum.
Ligustrum. Bryonia.	Galium boreale.
Cornus sanguinea.	Asplenium viride.
Viburnum Lantana.	Lycopodium selaginoides.
1.	1.
Rubia. Frankenia.	Andromeda. Meconopsis.
Polypogon. Thesium.	Pyrola minor, media.
Juncus acutus.	Vaccinium Myrtillus.
Genista pilosa.	Gnaphalium dioicum.
Cyperus longus.	Pinguicula vulgaris.
Erica vagans, ciliaris.	Parnassia. Comarum.

Those species enumerated in the column of upper limits, it is to be understood, have not yet been ascertained to rise *above* the zone under which their names are placed. Those enumerated in the column of lower limits, on the contrary, have not been ascertained to descend *below* the zone in which their names are placed. It is not very certain that the six species first named in the column for lower limits, are absolutely restricted to the superarctic zone. They are very rare even there, and extremely rare below, if found lower at all. The species enumerated for the inferagrarian zone, in the other column, are all rare; no plant generally diffused through that zone being quite restricted thereto. The *Clematis* was adduced in volume first, as one of the most characteristic plants; and it is certainly more frequent and conspicuous than any of those enumerated above. But it has been lately claimed as a plant of the Yorkshire flora; and if rightly so claimed, it must be deemed to occur within the midagrarian zone also, although locally restricted, and only slightly within that zone.

All species found at or near the coast-level, southward

of latitude 53, may be deemed to have their lower limits in the inferagrarian zone; at any rate, while looking only to Britain. Those selected for examples are such as prevail more in Middle or North Britain, or (*Meconopsis*) on the hills of Wales, and which do not occur in the Channel Isles. All of them, however, are reported in continental Normandy, with the exception of *Pyrola media*.

It appears quite unnecessary to repeat long lists of names here, for the purpose of exemplifying the regional or zonal floras in fuller detail. The zones for each species were indicated in the summary of distribution; from which any required lists can now readily be made, without the troublesome necessity of turning over all the pages of the preceding volumes. And in the seventh and eighth divisions of this volume—‘areas’ and ‘altitudes’—the species are enumerated in series and groups according to those geographical conditions with which the zones are most intimately connected, and in the climatal and floral characteristics of which they have really originated.

### 12. *Types of Distribution.*

This manner of viewing the distribution of plants within Britain was explained in volume first, on pages 43 to 55. It was again adverted to on page 232 of the present volume, in explaining the abbreviations used in the summary of distribution. Perhaps the ‘areas of species’ may now afford better data towards rendering such a geographic grouping of the British flora more fully intelligible. It has been much misapprehended by certain geologists, and perhaps by some botanists likewise.

On glancing over pages 282 to 302, it may be seen that most of the ‘austral species’ commence quite in the South

of England, in provinces 1 or 2, and in latitude 50—51. Tracing northwards, it is seen that some of these plants cease under each successive degree of latitude, and in each successive province from 1 to 18 inclusively. The australs were succeeded in the lists referred to by the 420 'general species,' enumerated on pages 302 to 305 as occurring continuously in 16 or more provinces. The general species, along with some of the most widely diffused of the australs, constitute that numerous group of plants which was designated the *British* type, because the species are found nearly or quite throughout Britain; full 300 of them occurring in every province (page 271). Those of the same two divisions which fail to attain the more northern latitudes, or which become decidedly rare in North Scotland, constitute a group designated the *English* type, mingled with two other types presently to be mentioned.

By continuing the glance from page 305 to 312, it may be further seen that a considerable number of the 'boreal and montane species' are distributed in a very different manner; only few of them reaching southward to provinces 1 or 2. Far the greater number commence more northward, and extend in the northern direction into provinces 15, 16, 17, or 18, some or all, that is, to the northern coasts of Scotland, or to its lofty hills which are situate between latitudes 56—58. If traced southward in a reversed direction from those coasts or mountains, they are found to attain their southern limits in the like gradual succession as the austral species attained their northern limits; some of them ceasing southward in each successive province from 18 to 1.

On looking more closely to the numeral figures which represent the provinces in the lists here referred to, it will be further seen that the distribution runs otherwise une-



qually among the provinces, besides the successive cessation from south to north, and from north to south. Thus, in the list of 'boreal and montane species' there is an evident tendency or entire restriction among many of them to the most mountainous provinces—15, or 15 16 17, or 7 - - 10 11 12 - - 15 16 17 18—while no such special tendency can be detected in others. This is connected with the double character of the group, implied in the title, and mentioned on page 318. The whole group is subdivisible into northern species and mountain species; although these two secondary groups really pass so gradually one into the other, as not to admit of any clear line of severance. Further, it may be observed that some of these plants terminate northward in provinces 10 or 12, more rarely in 11 or 14; not attaining the Highland provinces. There is thus seen to be a small group among the boreal and montane plants, composed of species which are restricted to the middle provinces, or else to the middle and some of the southern provinces; shunning those of North Britain. The differences here mentioned suggest a sub-division of the boreal and montane group, regarded as a whole, into *Highland*, *Scottish*, and *Intermediate* types; including with the latter some few mid-British plants which do attain the East Highland province.

Reverting to the list of 'austral species,' especially to its earlier sub-divisions including those plants which terminate southward of latitude 53 or 54, it will be noted that several of them occur only or chiefly in the easterly provinces—3, 4, 3 4, 2 3 4; others occurring only or chiefly in the westerly provinces—1 5 6 7—some or all of these; and the rest being found about equally diffused in both eastern and western provinces, as shown by the figures, and by the vowels indicating their longitudinal ranges. This tendency to one or other side of the island

is also traceable among some of the australs which extend to more northerly latitudes than 54. It will be recollected, that a like tendency was made apparent by the treble column of figures set after the names of plants in the 'census of species,' where many of the sub-provincial figures were widely unequal for the eastern and western sides of England; others being nearly or quite equal for both sides, opposite the same name. The large group of austral species accordingly admits of distinction into three types, by the severance of the less numerous *Atlantic* and *Germanic* types (western and eastern) from the prevailing *English* type.

Lastly, many species are restricted to single or very few provinces, as is shown in the lists by the paucity of their corresponding provincial nos. These constitute the so-called *Local* type of distribution; but they resemble each other only by the small extent, and not by the geographical position, of their areas. Several of them can be assigned with some confidence to the other more true types. For instance, all the truly mountain plants distinguished by the no. or figure 15 only might properly enough be assigned to the Highland type. In turn, austral plants distinguished by the figures 3 or 4 only may nearly all of them be united with those of the Germanic type. And such as are distinguished by the figures 1 or 5 only may mostly be assigned to the Atlantic type. Indeed, these assignments of the local plants were frequently indicated by the appropriate initials in the summary of distribution either primarily or secondarily.

In this manner, through the arrangement of the species-areas into series and groups connected with latitude and elevation, and more sparingly with longitude, we can again arrive by a somewhat different route at the types of distribution explained in volume first. And it will now

be sufficiently apparent that the triple division of the areas, in the lists on pages 282 to 312 of this present volume, is resolvable into those types of distribution nearly (not quite exactly) thus :—

1. Austral, into English—Germanic—Atlantic.
2. General, into British ;—some “ australs ” added thereto.
3. Boreal, etc., into Highland—Scottish—Intermediate.

The local species being scattered partly among the australs, partly among the boreals. It may further assist to give correct ideas about these geographic groups in the general flora, if they are now presented to the eye in a more direct connexion with the latitudinal and longitudinal divisions of the island, thus :—

1. British type,—species widely spread through S. M. N. Britain.
  2. English type,—species chiefly seen in South or in S. M. Britain.
  3. Scottish type,—species chiefly seen in North or in N. M. Britain.
  - Intermediate type,—species chiefly seen in Mid Britain.
  4. Highland type,—species chiefly seen about the mountains.
  5. Germanic type,—species chiefly seen in East England.
  6. Atlantic type,—species chiefly seen in West England.
- Local species, restricted to single or few provinces.

The reader is now requested to look back to page 54 of volume first, where it is sought to be impressed on attention, that no abrupt distinction is traceable between these types of distribution. It is very important to keep this fact in recollection. The differences between them are real, because a prevailing tendency to such peculiarities of distribution is quite apparent among the plants of this country ; so that examples can be numerous cited in illustration of each of the six (or eight) types here adopted. It is not less true also, that the distribution of many species exhibits a mingled and intermediate character ; inducing much uncertainty, and leaving a wide option in deciding the question, where among them a separation would be best made between the groups. This



may be illustrated by the three austral types—Atlantic, English, Germanic—with the help of the double set of initial letters, as they were explained on page 232, thus :—

Atl. A.e. E.a. Eng. E.g. G.e. Germ.

Whether the type of distribution for a species should be deemed English inclining to germanic, or Germanic inclining to english, is occasionally so uncertain as to leave the assignment of the plant to one or other type almost purely optional. And the former compound passes into the simple English type, and the latter compound passes into the simple Germanic type, in the like gradual and scarcely distinguishable manner. The same will be found to hold true on looking to the types which originate in the connexion of latitude with elevation, more directly than with longitude. Thus :—

Eng. E.b. B.e. Brit. B.s. S.b. Scot. S.h. H. s. High.

Through the various species which are interposed because resembling two of them, the English, British, Scottish, and Highland types slide into each other. And when it is required further, to intermingle with these also the 'Local' and 'Intermediate' types (so designated expressly on account of the areas of their species not sufficiently corresponding with any of the other six types) the incorrectness of asserting hard distinctions between the groups, in respect to their present areas, ought to become sufficiently manifest to the feeblest of reasoners. And very slender botanical knowledge should now suffice to prevent a continuance or a repetition of that error.

The employment of the small letters, which show that upwards of one-third the total number of species are connected intermediately with other types than those indicated by their capital letters, does in fact raise the number of types to twenty or thirty. In so doing, it implies truly

a gradual transition between the six (or eight) primary types, adopted as leading divisions; while these in turn admit of union into three others, — austral, general, boreal.

Still, it has been found possible and preferable to assign nearly two-thirds of the total flora to the eight more primary types (including the 'intermediate' and 'local') by the single initial capitals only. This strongly confirms the view, that there truly is some prevalent tendency for the plants to be distributed in the manner laid down by the definition of the types. Originally suggested and published in 1835, on data much less ample and corrected, the added knowledge of a score of years makes no real change in the types then defined; although various individual species are now assigned somewhat differently among those types, chiefly by the small secondary initials, more seldom by the primary capitals.

Be it remembered, nevertheless, that such a division of the total flora into these types of distribution is by no means perfect. It cannot conglomerate the species into groups characterized by a strict identity or sameness of their distribution. It is an eclectic arrangement; picking out species according to similarity in some of their geographical peculiarities only, not in all of them; such similarity being traceable chiefly to altitude and latitude and longitude taken together, not singly and apart from each other. It is not sameness of area, however, but rather a close resemblance in the direction of increase and decrease, that is to be deemed the leading character which unites plants under the same type.

This mode of viewing the distribution of species is still essentially a climatal classification of them, though not exclusively so. It would seem not incorrect to regard the types as representing so many present climatal areas,

which are not separated by limitary lines, as the climatal zones are supposed or feigned to be, but which amalgamate and intermingle one with another. The actual areas and sites of the various species, as well as the direction of increase or decrease in abundance, appear on the whole to accord so closely with existing climatal and other physical conditions, as legitimately to warrant a conclusion, that the *present* distribution of plants within this country is mainly determined by its *present* physical circumstances.

It is therefore contended, that there is no necessity to invent suppositious explanations about the present geographical positions of the species in this country, under the notion that it is still determined by the conditions and occurrences of myriads of years ago. In existing diversities of climate and local conditions, we find abundant circumstances to account for diversities of distribution. Equally so, in existing similarities of climate and local conditions, may be found ample circumstances to account for similarities of distribution. And in each case the transition from similarity to diversity, and conversely, is so very gradual, that any such invented explanations, which presuppose a hard division of the flora into half-a-dozen clearly distinct groups, may fairly be held to arise from a misconception of the true character of the geographic or distributive types.

The past history of the species individually considered, their comparative ages, and their original introduction to (or inchoation in) Britain, are subjects fairly open to the investigation of botanists and geologists. Such subjects do not appear to be necessarily beyond the scope of human inquiry or successful research; although hitherto the speculations on them have proved so futile, and unproductive of little else than misconception and misrepre-



sentation. But it seems an unwarrantable pre-decision to assert, that in arranging plants into groups accordant with present peculiarities of distribution, we are in this manner forming them into groups which equally represent differences of age and origin.

To designate those geographic groups, made in accordance with present peculiarities of distribution, as so many distinct "floras," seems only a premature misuse of this term. — The species cannot be held to constitute distinct floras by geographical or topographical position, because they constantly intermingle; so much so, that not a single province among the whole eighteen can be named, in which less than three of the six types occur; while four or even five of them are represented (by some of their species) in many of the provinces.—The species cannot be held to constitute distinct floras botanically, because no peculiarities of structure or classification have been shown to characterize any of the types, other than such as are usually traceable in relation to existing climate in its connexions with difference of elevation, latitude, &c.—The species cannot be held to constitute distinct floras by duration, because no evidence is yet forthcoming, at all adequate to show which species of the indigenous flora have been the longest time in Britain, or are the oldest by their whole existence, if these are not coeval durations.

In reference to this last ground of objection, it ought to be clearly understood by geologists and others interested in the matter, that not the slightest botanical evidence has hitherto been adduced, on which to found a belief, that the types of distribution here treated about are in anywise connected with the comparative ages of the species assigned to them. No botanical facts are known, such as can warrant an assertion that any one of

these geographical groups is of greater geological antiquity than the other groups. Highly probable as it may seem to be, that existing species do differ in their comparative duration on the earth,—perhaps vastly differ in that respect,—there is still not a tittle of botanical evidence to connect past differences of duration with present differences of distribution in any part of Britain.

If such a truth there be, it would prove a grand advance in science to find out the mode of demonstrating that truth. But there is no real progress made by hazarding idle assertions on the subject, without showing the existence of credit-worthy evidence in support. And something worse than no progress at all is achieved, by first arbitrarily marking out spaces on a map, and next pretending to illustrate them by citing false lists of species in sham support; the real distribution of several of those species, ignorantly huddled together to back up a pre-conceived and pre-announced hypothesis, being widely at variance with the spaces so marked on the map. (See Appendix to Volume First).

It will have become evident from the general tenor of the preceding remarks, that an assignment of the various species to their respective types of distribution in Britain, must truly be in some measure optional or arbitrary; that is, the species of an intermediate character of distribution might be assigned differently by two botanists, each acting on his own individual judgment formed on the same facts. No exact degree of northern latitude can be stated as a limit for plants of the English type; nor can any exact degree of southern latitude be indicated for the limit of plants assigned to the Scottish type. No precise degree of eastward longitude can be specified as the limit for plants of the Atlantic type; nor can any precise degree

of western longitude be mentioned as the limit for plants of the Germanic type. No definite range of altitude, nor of proximity to mountains, can be laid down as a positive rule of separation between plants of the Highland and Scottish types. Equally impossible is it to apportion the provinces between the types; several being represented in each province. But accepting the initial letters as they were applied in the 'summary of distribution,' chiefly on the detail of facts in the three preceding volumes, and before the succeeding lists in this volume had been fully made out, they are found to apportion the species thus:—

British type	has	532	primarily,	98	secondarily.
English type	„	409	„	167	„
Germanic type	„	127	„	68	„
Highland type	„	120	„	21	„
Scottish type	„	81	„	23	„
Atlantic type	„	70	„	33	„
Intermediate t.	„	37	„	36	„
Local, Doubtful	„	49	„	40	„

The names are here placed in a series according with the number of species primarily assigned to the several types. It will be observed that the numbers of those secondarily so assigned do not run regularly. The average for the second column would be rather above one-third of the numbers stated in the first column. The first figure in the second column is much below that average; and it could scarcely be otherwise. It has been shown that 495 species are quite absent from North Britain; and 145 species are equally absent from South Britain. None of these could be assigned even secondarily to the British type. Nor of course could any of the 532 species primarily so assigned. And after deducting these from the whole flora, there remains only a fragment or scanty number, among which to find species inclining to the British type sufficiently to demand the addition of the



small letter 'b' in qualification. The second figure is in excess; in part so doubtless because many widely-diffused species become rare in North Britain; and while their wide areas are best indicated by the letter 'B,' their northerly attenuation seems to require the qualifying letter 'e' added thereto. Both Germanic and Atlantic types are in excess; the former exceeding a half, and the latter not much below a half, instead of a third. This of course implies that many English plants do slightly prevail on one or other side of the island, besides those primarily assigned to the eastern and western types. The numbers of species secondarily assigned to the Highland or Scottish types, especially to the former, are much below average; the montane and boreal plants thus appearing to be more clearly distinguishable from the rest, than the Atlantic and Germanic are from the English.

On combining the types into austral, boreal, and general, we should have the primary numbers brought out thus :—

English, Germanic, Atlantic,	606 species.
Scottish, Intermediate, Highland,	238 „
British, representing the general,	532 „
Local, Doubtful,	49 „

These latter numbers cannot be expected to correspond with those before stated for other groups of species, equally designated 'austral, boreal, and general' on page 320; the principle on which they are formed being only partially the same, besides the separation of 49 local and doubtful plants.

It is perhaps of little import to give a tabular summary of the species according to their orders. But some botanists seek to connect differences of structure and classification with differences of age or duration on the earth; and these again with differences of distribution. An

*Ordinal arrangement of Geographic Types.*

	B.	E.	G.	H.	S.	A.	L.	I.
1. Compositæ	46	32	18	29	5	2	1	2
2. Gramina	56	24	14	8	4	4	2	-
3. Cyperoides	45	14	5	12	7	4	5	1
4. Rosaceæ	18	42	-	5	3	-	11	3
5. Leguminiferæ	24	28	7	2	2	5	1	1
6. Cruciferæ	20	21	3	3	1	5	3	4
7. Umbelliferæ	18	22	6	-	2	6	1	2
8. Caryophyllaceæ	24	13	4	8	5	-	2	1
9. Scrophulariaceæ	20	13	6	3	1	4	-	1
10. Lamiaceæ	21	16	4	-	3	1	2	-
11. Filices	17	6	-	6	4	5	-	1
12. Orchidaceæ	10	11	11	-	4	-	2	1
13. Ranunculaceæ	11	11	6	1	3	-	1	2
14. Amentiferæ	14	6	-	8	4	-	1	1
15. Polygonaceæ	14	8	1	2	1	-	-	-
16. Juncaceæ	13	5	-	6	1	-	-	1
17. Chenopodiaceæ	10	5	8	-	-	-	1	-
18. Potamaceæ	11	7	1	-	1	-	2	-
19. Boraginaceæ	10	6	1	1	2	-	1	-
20. Liliaceæ	2	6	4	-	1	2	4	2
21. Ericaceæ	5	0	2	6	4	2	-	1
22. Rubiaceæ	8	2	4	1	-	1	1	1
23. Primulaceæ	6	6	1	-	2	-	-	2
24. Geraniaceæ	7	4	-	-	1	2	-	-
25. Euphorbiaceæ	3	5	1	-	-	5	-	-
26. Gentianaceæ	5	4	1	1	-	-	1	2
27. Saxifragaceæ	4	0	-	7	2	-	-	1
28. Campanulaceæ	2	3	4	-	2	2	1	-
29. Onagraceæ	6	4	-	2	1	-	-	-
30. Crassulaceæ	1	2	1	2	-	4	1	-
31. Hypericum	5	4	-	-	-	1	-	-
32. Viola	4	4	-	-	1	1	-	-

arrangement into orders may facilitate their examinations, in respect to the plants of this country; and it is accordingly introduced here. Orders which include only one

	B.	E.	G.	H.	S.	A.	L.	I.
33. Orobanchaceæ	0	4	3	-	1	2	-	-
34. Equisetum	4	1	-	-	4	-	-	-
35. Alismaceæ	4	2	1	-	-	1	1	-
36. Papaveraceæ	3	3	-	-	-	1	-	-
37. Plantaginaceæ	5	1	-	-	-	-	-	-
38. Caprifoliaceæ	3	2	-	-	1	-	-	-
39. Typhaceæ	5	1	-	-	-	-	-	-
40. Lycopodium	3	-	-	3	-	-	-	-
41. Fumariaceæ	3	1	2	-	-	-	-	-
42. Pinguiculaceæ	2	-	-	-	2	1	1	-
43. Plumbaginaceæ	1	2	1	-	-	2	-	-
44. Illecebraceæ	1	1	1	-	-	3	-	-
45. Dipsaceæ	2	3	-	-	-	-	-	-
46. Valerianaceæ	2	3	-	-	-	-	-	-
47. Malvaceæ	2	2	-	-	-	1	-	-
48. Iridaceæ	1	1	-	-	-	1	1	1
49. Urticaceæ	3	1	-	-	-	-	-	-
50. Solanaceæ	1	3	-	-	-	-	-	-
51. Lemna	1	3	-	-	-	-	-	-
52. Haloragiaceæ	3	1	-	-	-	-	-	-
53. Linaceæ	2	-	1	-	-	1	-	-
54. Callitriche	3	-	-	-	1	-	-	-
55. Coniferae	1	1	-	1	1	-	-	-
56. Ribes	-	-	-	-	-	-	-	4
57. Helianthemum	1	-	-	-	-	1	1	1
58. Convolvulus	-	3	-	-	-	-	-	-
59. Drosera	1	1	-	-	1	-	-	-
60. Lythraceæ	1	1	1	-	-	-	-	-
61. Nymphaeaceæ	1	1	-	-	1	-	-	-
62. Melanthiaceæ	1	1	-	1	-	-	-	-
63. Polygala	1	1	-	-	-	-	-	1
64. Cuscuta	-	3	-	-	-	-	-	-
Orders of 2 species	7	17	2	2	-	-	-	-
Orders of 1 species	4	11	2	-	2	-	1	-

or two species, 34 in the whole, are omitted for brevity; the types to which their species were assigned being readily ascertained from the summary of distribution.



On looking to the tabular arrangement, the numbers will appear to run very unevenly or irregularly. As heretofore, the names of the orders are placed in a series according with their predominance in the total flora. The columns of figures for the types, indicated by their initial letters, succeed one another in accordance with the total number of species assigned to them respectively. Hence, if the numbers were evenly apportioned, they ought to show a constant decrease downward in each column, and a like decrease along each line read from left to right, from B to I. This is far from being the case; and doubtless there is some reason or explanation to be found for each of the various irregularities. Some of the explanations are artificial; that is, they originate in arbitrary interpretations of nature put forth in books. Others are natural; that is, they arise out of climatal and other physical conditions, independently of human caprice.

*Rosaceæ* afford an example of the former. This order has the largest figure under the English type; the explanation of which is found in the excessive subdivision of the genus *Rubus*, and the present necessity for assigning the ill-ascertained distribution of so many of its alleged species either to the English or to the Local type. So again, excessive subdivision of the genus *Hieracium* into ill-defined species, with ill-understood distribution, unduly raises the figure for *Compositæ* under the Highland type. Thus it comes, repeated over and over again, that an excessive subdivision of the species under a few genera, on a different principle from that followed in regard to the species of other genera, introduces anomalies and confusion into other departments of botanical science, besides the descriptive. Injudicious dabbling with species is not simply a harmless process, but one calculated to do much mischief, through falsifying the data required

for larger views than those which occupy the minds of the men of species. Unfortunately, men of this latter taste and attainment are quite as necessary to the philosophers of science, as the brick-makers and stone-cutters are necessary to builders and architects. A Humboldt or a Lyell would have made poor progress without the aid of species-describers; although they do incur the risk of being widely misled by trusting to them too implicitly.

*Filices* and *Orchidaceæ* afford opposite examples, in respect to explanation; while they also contrast oppositely against each other. Their numerical assignment to types here originates almost exclusively in the facts of nature, not in the fancies of botanists. The ferns are either generally diffused through Britain, or are characteristic of the northern and western provinces; comparatively few being assigned to the English type, and none to the Germanic type. On the contrary, *Orchidaceæ* are more largely assigned to the English and (especially) the Germanic types; with a smaller number of widely-diffused species assignable to the British type; none to the Highland or Atlantic. These assignments are traceable to climate, and perhaps partly to the character of the ground; orchids apparently having some special adaptation to cretaceous soils, and many ferns being adapted to rocky sites.

It is needless to multiply such explanatory examples. Those botanists who have understood the facts and figures of former lists and tables, will be prepared to seek out the explanations for themselves. But it is quite needful to keep in view the very different nature of the table on pages 511, 512, and the three summaries of orders before printed on pages 359 to 367. In the table here under consideration no species is counted twice;

that is, it is not reckoned in the figures for more than one of the columns. In the three ordinal summaries before printed, the same species become repeatedly reckoned. *Festuca ovina* was counted in each of the six zones; *Calluna vulgaris* in five of them; *Myosotis repens* in four of them; &c. &c. In the one case, the special characteristics of any part of Britain are mingled with the less special;—in the other case, they are eliminated from the companionship of the less special. In the one case, the influence of climate and other local conditions is made less prominent;—in the other case it is rendered more prominent. An ordinal arrangement of all the species found in England would doubtless give less austral proportions, than would a like arrangement of the species peculiar to England, apart from those which extend also into Scotland. The former would be a collective arrangement; and the latter would be an eclectic one,—in so far similar to that of types.

Before concluding the subject, it may not be amiss to remind botanists, that the grounds for such an eclectic division of a flora are not at all peculiar to the flora of Britain. Other countries admit of the same divisions of their total floras into general and partial types of distribution. It would be easy to make somewhat similar—not strictly identical—arrangements for the floras of other countries. Insular or sub-insular countries of considerable extent may perhaps offer more obvious facilities; but these are to be found in all countries.

In the peninsulas of Spain or Scandinavia, for example, the alpine, boreal, austral, occidental, and oriental types may be traced in connexion with varieties of climate;—not as really distinct floras, any more than in Britain, but as groups separable from each other, and from the



group of more generally diffused species among which they occur, by the partial sites and limitations either of their whole areas or of their centres of greatest frequency, along with the direction of their decrease or attenuation.

The same might be done also with the flora of Middle Europe, between the Mediterranean and Baltic seas. In addition to the generally distributed species, which are spread somewhat continuously from coast to coast, there is the large group of alpine species mingled with such of the more general species as are found to ascend to considerable elevations on the great mountains. There are also plants of the Mediterranean, Atlantic, and Baltic coasts, and others spreading away from those coasts more or less far inland; some of them meeting and crossing each other in their different directions of attenuation and successive cessation. And along with the general species that extend far eastward, there occur also yet other species which are wanting near the oceanic coasts; while in turn many of the occidental species are absent from the tracts where those oriental species are most prevalent or exclusively found. These are so many different types or characters of distribution.

On looking to Europe at large, as one whole area, certain general species are still found to be spread over all or much of this wide space, from North Russia and Sweden—some even from Lapland—southward to Spain, Italy, and Turkey. Mingled with these in the north, there are also truly boreal species which decrease in their abundance and successively cease southward. Many austral species in turn may be traced in the northerly direction, gradually decreasing in their abundance or frequency, and successively ceasing. So also are there various occidental and oriental species spreading in like

manner, respectively in their own opposite directions ; a repetition of what is seen in Middle Europe, carried further south and north. And to these again the plants of the mountains are to be added, first as one primary group, and then as sub-divisible into arctic and alpine and other subordinate groups, according to the geographic sites of the various mountain ranges.

These differences of distribution are familiar enough to botanists. They are practically recognized in stating the habitats of individual species, though seldom clearly or methodically described. When attempts have been made to divide a whole flora so as to show those differences of distribution, or to apportion the plants into corresponding groups, recourse has been had to fixed lines and definite spaces on maps, either actually represented or mentally feigned. The result has proved a sort of combination, or rather confusion, of local floras with climatal zones imperfectly brought out,—not the formation of eclectic groups, such as the types of distribution are intended to be.

This latter is confessedly an inconvenient designation, waiting the invention of a better name. That of 'flora' would be misapplied to them, as before mentioned ; for these groups are not so many different floras, but so many ingredients in one flora. Geographically, a flora may be said to include, or to consist of, various different types of distribution ;—much as it may be said, systematically, to include or consist of various different orders. Though the distributive types cannot be made so numerous as the orders, without frustrating the object sought in forming them.

Possibly, no two species in the whole flora of the earth have a distribution precisely the same. Probably, the species of every country will admit of being classed into

a few natural groups, based on some important resemblances in their distribution, with some important differences to distinguish one group from another. The resemblances on which the types have been formed for Britain are those of site and direction. A considerable number of species either restricted to, or radiating *from*, the same geographic site, are considered to constitute a true type of distribution; those absent from, or radiating *into*, that site, will belong to one or more other types.

Such eclectic groups will doubtless always bear an intimate relation to the climate and other conditions of physical geography in the country where they are found or formed. — The direction of their decrease may not unreasonably be held to suggest that of their immigration into the country, if immigrants; though there seems much likelihood of many important exceptions to the general accuracy and applicability of the suggestion.

To suppose that groups thus distinguishable from each other by present distribution, are also distinct by enormous differences of age, is a flight of imagination, not necessarily unsound, but as yet supported on no basis of sufficiently reliable facts in evidence of its soundness.

To suppose that the present occurrence of a dozen or a score of species on the hills of two distant countries, at present disjoined by an intervening ocean, is proof sufficient of former junction, seems quite beyond the bounds of legitimate reasoning. It implies that all lands have been joined to all other lands, at one time or other, since existing species appeared on the earth; A to B, B to C, C to D, and so on.—It all-but-unavoidably implies also that various species were formerly able to endure climates very dissimilar from the climates to which those



species (and to which alone, some of them) now seem specially adapted; insular and sub-insular climates differing so decidedly from those experienced on lands of wide continuity.—And the supposition assumes also an absolute distinctness of species, their non-transition, and their original descent from single or dual ancestors; highly important questions, yet too unsettled to admit of being so dogmatically answered, and so summarily disposed of, for the convenience of an untried hypothesis.

Moreover, there are various facts of distribution which accord better with the supposition of maritime and even atmospheric transport, than with that of land transport; allowing a more probable and more extensive influence to the former agencies, than the hypothesis of land-continuity appears willing to leave room for. Under existing knowledge, it would be very tedious and scarcely practicable to demonstrate the notion as a fact, that the coast-line flora of Britain is richer than the inland flora on an equal area, after excluding the strictly littoral plants from the former. Leaving out of count the alpine and humanly introduced plants, the most local species appear to occur on or near the coast in more than due proportion to those found inland only. If so, it would seem more reasonable to suppose those species transported to their present sites over the sea or through the air, than to refer their introduction to an overland route, and consequently more distant date. While it may still be true, that a former land-continuity, no longer existent, had largely contributed to the present flora of Britain, before the introduction of some subsequently sea-borne, bird-carried, or wind-wafted species, to augment its numbers.

## POSTSCRIPT.

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The first volume of this treatise bears on its title-page the date of 1847; the present volume will be dated in 1859, the year of its completion. The interval is long, and is incompatible with strict uniformity in a work on science, more particularly in one relating to a department of science which is recent in its origin, and which is scarce yet definitely outlined. During the full dozen years of interval, neither phytography nor phyto-geography have stood still. Nor have the author's own ideas and inspirations been quite unchangeable during the same period.

Those readers who may seek to understand the *Cybele Britannica*, to use it and to judge it, will of course bear in mind that later statements must be taken to qualify earlier statements, where discrepancy may become manifest. Even this one concluding volume by itself, apart from the three former volumes, may require some such consideration; its earlier pages having been in print a full year before the latter pages were written. Circumstances of no public interest left the author only an option between desultory writing, much interrupted by other calls on his time and thoughts, and indefinite postponement of a concluding volume.

It is difficult to keep up a continuous uniformity under repeated interruptions and considerable lapse of time. To write a work that is novel in its plan and purpose, by successive instalments, and to print it in like manner, could scarcely fail to give to it something of the piecemeal character. The earlier portions could not be made to lead to the after portions in a sufficiently direct and connected manner; because the form in which it would be found most convenient to draw out those after portions for printing, especially the tabular lists, was only decided as they were successively prepared for the press. Some repetitions, and frequent back references, have hence become necessary in this last volume, which might have been less required under other circumstances.

Wide differences of date in the volumes have also tended to augment bulk. For instance, upwards of two hundred pages of the third volume were devoted to "additional species and notes," in order to bring up the contents of the two preceding volumes to the same date. But if those three volumes could have been printed and published almost simultaneously, most of the requisite alterations might have been made by a few figures and statements in the manuscripts, without augmentation of bulk. Such alterations have been made in re-stating the distribution of several species in this fourth volume; so that the areas and census, the altitudes and temperatures, as indicated in the lists, will not always correspond with those stated for the same species separately in the former volumes.

Doubtless another dozen or score of years will again accumulate another store of facts, to yield another supply of "additional species and notes," such as may again lead to various alterations in minor details. But the distribution of the several species, as now set forth in the lists,



may be held approximately correct in the main; although many alleged facts must still be deemed uncertain, and many vacancies may still remain for future observers to fill up and complete.

It is much to be feared, however, that errors and misreports about plants and their localities are accumulating at the present time in much augmented proportion, if measured by the reliable facts placed on record. Juvenile dabblers in botany, and very superficial amateurs, are too much encouraged to seek printed publicity before qualifying themselves by adequate knowledge. These ill-informed writers not only encumber the literature of botany with their own blunders and valueless repetitions; but they also disgust and deter more competent persons, whose writings might do real service to science. Competent botanists very properly dislike to lower themselves, by contributing to journals which are edited for the ignorant, or filled by the effusions of incompetent scribblers. Much as this state of matters is to be regretted, it is not easy to see any practical remedy. The competent are comparatively few; the incompetent are many; and those who make a trade of science must adapt their publications to the many, on pain of pecuniary loss.

Still, each successive year doubtless adds something to the store of serviceable scientific knowledge in every department, if it could be separated from the worthless trash. By the *Cybele Britannica* one department of botany is brought up to the state of present knowledge. It is the Author's wish to print supplementary sheets, from time to time, in order to keep his work up with the progressive advances of knowledge in regard to the topographical distribution of British plants. These will be sent free by post to those Botanists who possess copies

of the work, on communicating their addresses to the Author, and expressing a wish to receive any such supplementary sheets, if printed. The carrying out of this wish into effect must depend on life and health, and on other possible contingencies beyond individual control. And to some extent it must also depend on the communicative goodwill of those persons who may discover botanical facts, such as will fill up vacancies, or necessitate alterations in any of the statements and figures set forth in the pages of this work. Incidental examples of what is required may be seen on pages 320 and 351.

It would be hopeless to expect typographical accuracy in all the vast number of figures printed in this work, and particularly in this fourth volume. Errors in letters and words, or in spelling and syntax, will occasionally be overlooked while reading proof-sheets; although the sense and signification of sentences much assist in their detection. Such assistance is wanting in the case of numeral figures; these being mostly mere symbols, not mentally construed into their real meaning, during the process of reading a proof-sheet; so that the chance of undetected errors becomes considerably increased; while, at the same time, a single figure set wrong may be a large mis-statement of fact. The same is equally or even more true in respect to the mechanical process of transcribing figures for the press. In connexion with this remark, the author feels it due to the printer of the *Cybele*, to say that great care appears to have been taken to make the printed figures correct. And the press is of course nowise responsible for errors of transcription.

A few words of explanation on the literary department. In the three earlier volumes, where the author required to refer so frequently to his own personal experience and individual views about details, it was found convenient to

adopt the brief egotism of the first pronoun. In this last volume he uses the third person by preference. Thus, a want of literary uniformity is further added to any discrepancies arising out of the progressive nature of scientific knowledge, and the successive dates of writing. This may be held a fault of some literary magnitude; and it stands not alone. Indeed, the author may freely acknowledge that he feels no care about literary style in writings intended for scientific uses. Accuracy in fact rather than accuracy in words, correctness of ratiocination much more than correctness of composition, have been his uppermost wishes while writing the *Cybele*.

That such wishes have been altogether successfully carried into effect, he does not pretend. He never yet re-read in print aught written by himself, without a decided conviction that it might have been much better done,—better planned, and better worked out. This not very pleasant reflection may perhaps be attributed in part to the newness of the subjects which have most occupied his attention; and for which there existed no ready-made models, to be adopted or improved upon. As the ‘united wisdom of the realm’ can never pass a new Act of Parliament, without shortly finding need for another “Act to amend an Act passed,” &c. So,—to compare little things with large,—it seems to be only in ordinary keeping with the early imperfectness of human efforts, that first books on a subject should soon be found susceptible of amendment.

If the ‘*Geographie Botanique*’ by De Candolle had preceded the earlier volumes of the *Cybele*, some difference might likely have appeared in the formula of species-distribution used in those volumes.—If the views of Darwin, on the mode in which varieties may supplant their ancestral species, had been earlier explained in



print, some change might have been made in the second chapter or division of this volume, where remarks occur on the inequality and the permanence of species.—If the 'Handbook of the British Flora' by Bentham had been sooner seen, probably it would have given encouragement to the rejection of several segregate species, which are admitted into the lists printed on preceding pages. Although it is thought that some among Mr. Bentham's aggregations would not have been recommended by botanists who devote a closer or more exclusive attention to the plants of this country.

While writing about the 'areas of species' or about their arrangement under 'types of distribution,' a reference might have been properly made to an article in a late no. of the Zoologist, which was read with much satisfaction by the writer of the Cybele. Messieurs T. Boyd and A. G. More have there traced out the distribution of the Butterflies through the same eighteen provinces; and they have also tried how far the same types of distribution might be found applicable to those locomotive insects. Whatever the origin of the various species of butterflies, natives of the British Isles, their capabilities of self-distribution are so great, that it seems reasonable to suppose their present distribution chiefly determined by food and climate. The same writers suggest that the land mollusks and other stationary members of the fauna might be advantageously studied on the same method. See Zoologist, no. 189, pages 6018 to 6027.

On pages 55-6 a few words are borrowed from Lyell's Principles of Geology. Possibly they may mislead when there read apart from that Author's own text. Lyell's doctrine is, *Creation, at a very slow rate, relatively to the total number of existing species.* A special measure of

Divine progress in the creations attributed,—“if one new one were to be every year called into being,”—is assumed by the great geologist only for the sake of argumentative illustration, and not as the actual or even hypothetical rate of successive creation and extinction of species. But the principle remains the same, whether the rate assumed is one a day, or one a year, or one a century.

It is conceived that the arguments of Lyell will not be unfairly represented in the following postulates:—1. One new species of animal or plant might have been created yearly, and one old species might have been extinguished yearly, without mankind having become aware of these events.—2. Such a rate of change would have been adequate to effect the displacements and replacements of species, between times past and times present, which are discovered by geologic researches. — 3. New creations of distinct species in each case afford the more probable explanation of the mode of change, because we do not detect any present mutation of species, such as can be deemed adequate to account for the geologico-historical facts ascertained.

Let that rate of change in the flora or fauna of the earth be argumentatively admitted as true; namely, one a year. And let the expressions ‘ten million’ and ‘ten thousand’ be employed to designate large un-counted numbers. Lyell’s arguments may then be met by counter postulates, quite as plausible in themselves, and more in accordance with known facts, than is the idea of so many sudden creations of unchanging species, distinct from first to last.

1. The typical form of any species is the standard or average of the ten million individuals which represent it at any date.—2. Each year ten thousand species may possibly be undergoing an excessively minute change in

their standard or average types, arising out of some slight changes in some of the ten million individuals, which go to form the average.—3. It may perchance take ten thousand years to operate a change in the average type of any species, equal to the difference between two species.

These slow changes in the average types would be inappreciable to mankind under past and present conditions of scientific record.—They would not require individual changes so great or rapid as those which are actually observed any year in the occurrence of varieties.—And yet they would suffice to alter the whole flora and fauna of the earth at the rate proposed by Lyell, as being adequate to account for the facts ascertained.

Thames Ditton—Kingston—Surrey.

*April, 1859.*





# CYBELE BRITANNICA

OR

BRITISH PLANTS AND THEIR GEOGRAPHICAL RELATIONS

By H.-C. WATSON

Londres, 1859 ; in-8°, vol. IV.

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TIRÉ DES ARCHIVES DES SCIENCES DE LA BIBLIOTHÈQUE UNIVERSELLE.

Juillet 1859.

*Avec autorisation de la Direction.*

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M. Watson vient de publier le quatrième et dernier volume de l'ouvrage intitulé *Cybele britannica*. Que signifie ce mot *Cybele*, qu'il a introduit dans la science ? Est-ce une fantaisie, une bizarrerie ? Non, le terme est nouveau, mais la chose aussi est nouvelle. Il s'agit d'un ouvrage dans lequel on énumère toutes les plantes d'un pays, au point de vue de leur distribution topographique et géographique seulement, et non point de leurs caractères ou de leurs différences botaniques. Ce n'est pas une *Flore*, car il n'y a pas de descriptions, ni de synonymes ; c'est un ouvrage plus spécialement consacré à la géographie botanique d'un pays, et puisque la déesse Flore a été invoquée dans un des cas, on pouvait, de la même manière, placer l'autre genre d'ouvrages sous l'invocation de Cybèle. Ainsi, les phénomènes de végétation qui se remarquent sur la terre de la Grande-Bretagne, la position des espèces dans toutes les parties de l'île, leur groupement dans chaque subdivision, à chaque élévation, leur origine, si on peut la deviner, tout cela constitue une *Cybele britannica*. Il serait à souhaiter qu'on eût des ouvrages de cette nature pour d'autres pays, comme complément des flores et comme moyen de comparaison pour la géographie botanique.

Le dernier volume de M. Watson est consacré aux résumés et aux considérations générales qui découlent des nombreux détails contenus dans les trois premiers. Comme ceux-ci ont paru dans le laps de douze ans, et qu'on a publié depuis quelques années des ouvrages importants sur la flore anglaise et sur la géographie botanique, l'auteur complète ou corrige quelques faits, et surtout il discute les opinions de ses prédécesseurs. Plusieurs articles sont des commentaires, tantôt approbatifs, tantôt critiques, de l'ouvrage que nous avons publié nous-mêmes sous le titre de *Géographie botanique raisonnée*. Nous les signalons aux personnes que ce dernier ouvrage a pu intéresser. Nous ne nous plaignons pas de la part que M. Watson nous a faite en voyant quelle petite opinion il professe de l'intelligence des botanistes en général. Selon lui <sup>1</sup>, « c'est une particularité de l'esprit botanique de ne pas raisonner toujours avec exactitude et rigueur. » Or, selon M. Watson, nous échappons quelquefois, même souvent, à ce défaut, en particulier dans ce qui concerne les généralisations ; ainsi, je le répète, nous ne nous plaignons pas.

S'il fallait défendre la généralité ou au moins la majorité des botanistes contre les imputations de l'auteur anglais, nous ferions deux réflexions. L'une, que dans les sciences d'observation comme la botanique, il y a toujours un nombre immense de faits qui sont plus ou moins douteux, et sur lesquels on est obligé de s'appuyer, tout en sachant qu'ils ne sont pas un appui bien solide. On raisonne sur l'évolution des organes, et jamais l'œil humain, armé des plus forts microscopes, ne peut voir et ne pourra voir l'origine d'une chose, puisque la matière est indéfiniment divisible. On raisonne sur la symétrie des organes, mais elle n'est jamais mathématique et absolue cette symétrie. En géographie botanique, un auteur exact dit qu'une espèce croît dans les terrains cultivés, mais cela ne veut pas dire qu'elle n'ait jamais été rencontrée à côté de terrains cultivés ou dans des endroits qui ont été autrefois cultivés ou qui sont à peine cultivés ; on dit qu'une espèce s'élève jusqu'à mille mètres sur telle montagne, mais cela ne veut pas dire que la limite soit rigoureuse et permanente. Les faits d'histoire naturelle sont vagues, flottants, incertains, au point de vue d'une rigueur absolue ; il est impossible que les raisonnements bâtis sur ces faits ne participent pas du même défaut. Ils ne sont pas plus mauvais que ceux qu'on fait en histoire, par exemple, où ils ne sont pas rigoureux, attendu qu'on présume les opinions d'un homme d'Etat, qu'on suppose telle opinion chez un roi ou dans le public, d'après quelques faits connus, et qu'on

<sup>1</sup> Volume IV, page 12.



raisonne en conséquence. La seconde réflexion que nous suggère l'ouvrage intéressant de M. Watson, c'est qu'il nous paraît s'abstenir trop complètement de la méthode vraiment logique des hypothèses. Elle est très-logique et scientifique cette méthode, pourvu qu'on sache toujours ce qui est hypothèse. Les physiciens, les astronomes s'en sont bien trouvés ; nous ne voyons pas pourquoi les naturalistes se refuseraient à l'employer. L'attraction universelle, les proportions déterminées, les ondulations ou l'émission de la lumière, sont des hypothèses, que des faits nouveaux pourraient renverser, et cependant ce sont de grandes et utiles notions, qui font prospérer plusieurs sciences. Lorsqu'on dit en géographie botanique : les espèces sont distribuées aujourd'hui comme si des terres maintenant séparées par la mer avaient été jadis réunies, on fait une hypothèse qui n'est pas à dédaigner. Lorsqu'on étudie la limite boréale d'une espèce, et qu'après avoir tourné et retourné de cent manières les chiffres exprimant la température, mois par mois, jour par jour, en détail et en somme, le long de cette limite, on arrive à dire : l'espèce s'est répandue sur tel continent comme si elle ne pouvait pas supporter tel extrême de froid, ni se passer de telle somme de chaleur, au-dessus de tel degré ; on fait une hypothèse, et plusieurs hypothèses de cette nature jettent du jour sur la physiologie autant que sur la géographie botanique. Si l'on s'abstient de ce genre de considérations, si l'on s'en défie, dans le but de se borner à des raisonnements rigoureux, on se prive d'un moyen de faire avancer la science, au milieu des obscurités et des incertitudes qui environnent tous les faits.

La prudence extrême de M. Watson, en matière de raisonnement, a peut-être eu l'inconvénient de limiter le champ de ses recherches et de ses réflexions, mais elle a eu l'avantage de le rendre précis et philosophique dans certaines questions délicates qu'il ne pouvait pas éluder. De ce nombre est celle de la distinction des espèces, genres et familles. Toute personne qui s'occupe de géographie botanique doit, une fois ou une autre, scruter la valeur de ces termes, l'importance de ces degrés d'association et la manière de les définir. M. Watson présente à ce sujet des réflexions intéressantes. Il développe surtout l'idée que les groupes de même nom dans les ouvrages des botanistes ne sont pas des associations assez égales et assez uniformes, pour que leur comparaison soit bien satisfaisante dans les relevés statistiques. On en convient généralement en ce qui concerne les familles, mais les espèces présentent le même inconvénient, car ce sont aussi des associations qui reposent sur des caractères

d'importance variée, soit en eux-mêmes, soit selon la manière de voir de chaque auteur, dans chaque cas particulier, et selon sa manière de considérer l'espèce en histoire naturelle. M. Watson s'appuie sur des exemples tirés des flores modernes de la Grande-Bretagne. Après avoir exposé la subdivision et la reconstruction successive de certaines espèces, en raison des connaissances du jour et des opinions de chacun, il constate qu'on pourrait reconnaître dans les espèces bien étudiées trois catégories : 1° des espèces agrégées, soit *sur-espèces*, comme, par exemple, le *Rubus fruticosus* ; 2° des espèces simples, indivisibles ou *vraies*, comme le *Rubus saxatilis* ; 3° des *sous-espèces*, provenant de la subdivision d'anciennes espèces, comme le *Rubus discolor*. Si l'on convenait effectivement de ce fait, qui résulte de l'histoire moderne de la science, on éviterait peut-être bien des querelles. Chacun viserait à faire, selon la tendance de son esprit, ou des *sur-espèces*, ou des espèces, ou des *sous-espèces*. J'irai même plus loin que M. Watson, je dirai que les auteurs de flores européennes pourraient marquer par un signe chacune de ces trois catégories d'associations spécifiques ou quasi-spécifiques. Je me hâte cependant d'ajouter que, pour la botanique étrangère, ce serait une utopie, dans l'état actuel de la science, puisque la plupart des espèces exotiques ont été faites sur des échantillons peu nombreux, souvent incomplets, ou sur des plantes cultivées, plus ou moins différentes des individus spontanés. L'avenir est dans le sens de ces subdivisions multipliées dans le mécanisme de la classification, car les ressemblances et les différences des êtres organisés sont infinies, et pour les représenter passablement, il faudrait des termes et des degrés d'association bien plus nombreux que ceux dont nous faisons actuellement usage ; mais l'état des connaissances et les matériaux imparfaits de nos collections ne permettent guère d'y penser aujourd'hui ; tout au plus pourrait-on essayer ce mode dans une monographie d'espèces bien connues ou dans une flore d'un pays tel que l'Angleterre.

La Grande-Bretagne étant une île dont la végétation a été étudiée depuis deux siècles et où les observateurs sont nombreux, j'avais consacré beaucoup de temps à chercher combien d'espèces et quelles espèces ont été introduites dans sa flore, soit avec certitude, soit avec probabilité, depuis les temps historiques. Pour cela, je m'étais appuyé sur tous les ouvrages anglais, particulièrement sur les premiers volumes de la *Cybele britannica*. J'ai introduit dans cette recherche la notion de la distribution des espèces sur le continent et celle des noms vulgaires celtiques, comme complétant ce que l'observation actuelle des espèces dans la Grande-Bretagne



a pu fournir sur leur origine. M. Watson revient, dans son quatrième volume, sur ce sujet intéressant, et discute de nouveau les mêmes faits. Depuis 1855, époque à laquelle ma *Géographie botanique* a paru, il ne semble pas que l'étude des noms primitifs gallois, écossais ou irlandais des plantes douteuses quant à leur origine, ait fait le moindre progrès. M. Watson pense que, dans certains cas, je n'ai pas connu suffisamment le degré de valeur qu'il faut attribuer à telle ou telle assertion de botanistes anglais : cela doit être, j'en conviens, vu ma position d'étranger. D'un autre côté, je persiste à croire que la distribution dans les pays voisins n'a pas été assez étudiée par les Anglais, par M. Watson lui-même, et qu'elle suffit quelquefois à indiquer si une espèce existe en Angleterre par des causes naturelles anciennes, ou si elle a été jetée accidentellement dans ce pays, hors de ses limites, par une cause moderne. Pour peu que, dans ce cas, les indices locaux s'ajoutent aux indices généraux, l'espèce a été probablement introduite. Malgré la différence des méthodes suivies par M. Watson et par moi dans cette recherche intéressante, nous sommes arrivés à des résultats assez semblables. Non-seulement nous nous accordons sur beaucoup d'espèces, mais encore nous arrivons à un chiffre total d'espèces introduites dans la végétation spontanée britannique assez semblable et toujours très-faible. Je comptais comme certainement d'origine étrangère et devenues spontanées, 83 espèces ; comme probablement d'origine étrangère, une centaine ; total : 183. M. Watson considère comme étrangères (*alien*), 180 espèces, et par ce mot il entend des espèces plus ou moins bien établies parmi les plantes spontanées anglaises, mais ou présumées, ou certainement d'origine étrangère. D'ailleurs, je n'ai rien vu dans la *Cybele* qui modifie le résultat le plus important peut-être de mes recherches, que dans une île séparée d'un continent et d'une autre île par des bras de mer d'une faible étendue, il n'existe pas d'exemple prouvé, ni même d'exemple probable d'une espèce introduite par les causes naturelles, comme le vent, les courants ou les oiseaux ; tandis que, pour l'immense majorité des espèces d'origine étrangère, on peut déterminer historiquement ou soupçonner par de bons motifs un transport par l'homme, au moyen des vaisseaux, des graines importées, des cultures, etc. Par conséquent, l'effet des causes naturelles de transport avait été fortement exagéré ; par conséquent aussi, entre l'époque des derniers événements géologiques, ayant modifié une île relativement continent, voisin, et l'arrivée de l'homme, il doit avoir existé ordinairement une période pendant laquelle la végétation est restée pure de tout mélange. On



sait, par la géologie, que cette période a pu être longue dans certaines contrées, et l'on est conduit ainsi à des réflexions intéressantes sur l'histoire du règne végétal.

Le dernier volume de la *Cybele britannica* renferme de nombreux tableaux et résumés statistiques de la distribution des espèces et des familles dans les grandes et les petites subdivisions géographiques admises par l'auteur. Ces dernières, inférieures aux comtés, sont au nombre de 112. Il n'y a pas de pays d'une étendue égale à la Grande-Bretagne, dans lequel on ait constaté la présence ou l'absence de chaque espèce dans des districts aussi multipliés. Les limites boréales ou australes des espèces qui ont une limite dans l'île, découlent de ces tableaux ; les limites en altitude, supérieures et inférieures, sont données également, pour un plus grand nombre d'espèces qu'on ne l'avait fait jusqu'à présent et avec plus de soin ; mais à cet égard la Grande-Bretagne ne présente pas beaucoup d'intérêt, vu le peu d'élévation de ses montagnes. On trouve dans l'ouvrage de M. Watson un grand nombre de renseignements et de réflexions intéressantes sur les espèces tout à fait locales (vol. IV, p. 443), sur les plantes irlandaises qui manquent à la Grande-Bretagne (p. 227), sur l'absence presque complète d'espèces propres à cette dernière île (p. 389), et sur une manière de grouper les espèces d'un pays en certains *types de distribution*, d'après leurs analogies actuelles de conditions géographiques, malgré leur mélange partiel sur plusieurs points (p. 499). Bien des questions de géographie botanique ne peuvent pas être étudiées à fond, ni même être abordées lorsqu'on part de l'étude d'un certain pays en particulier. Il y a, en général, plus à apprendre par l'étude d'une certaine espèce ou d'une certaine famille à la surface de la terre, que par l'examen d'un district ou d'un pays plus étendu, mais la forme et la nature d'un ouvrage tel que la *Cybele britannica* vous place nécessairement sous les conditions du second de ces points de vue. Ne le regrettons pas, puisque M. Watson a fait un travail consciencieux et approfondi, résultat de plusieurs années de recherches et de réflexions, et que l'exactitude des détails se trouve rehaussée souvent dans cet ouvrage par des appréciations justes ou nouvelles.

Alph. DC.















